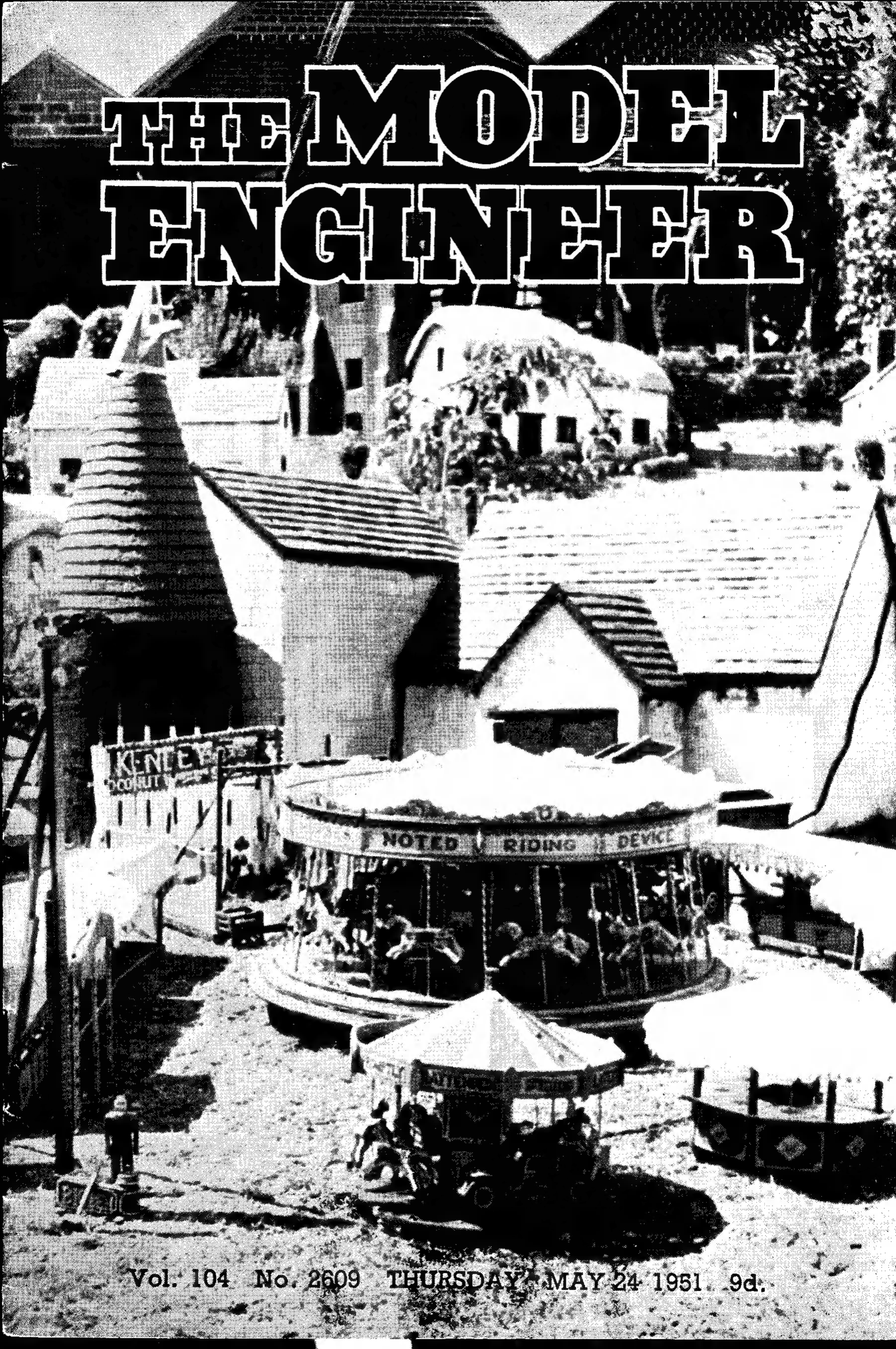
THE MODEL ENGINEER



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The MODEL ENGINEER

PERCIVAL MARSHALL & CO. LTD., 23, GREAT QUEEN ST., LONDON, W.C.2

24TH MAY 1951 VOL. 104 NO. 2609

SMOKE RINGS

"M.E." Exhibition Tractions

● SINCE THE publication, on March 8th, of Mr. E. J. Baughen's suggestion that a space should be reserved at the "M.E." Exhibition to enable model traction engines to be run in steam, we have received several letters welcoming the idea.

We are sure that many visitors from overseas, who will be at the exhibition, will wish to see something characteristic of this country, and we think they would enjoy demonstrations of this kind.

The Exhibition Manager would like all those who possess traction engines and would be willing to operate them at the show to write to him at 23, Great Queen Street, London, W.C.2.

Don't Forget the Photographs!

● READERS WHO have applied for entry forms for the "M.E." Exhibition, competition section, will doubtless have noticed the paragraph inviting them to submit photographs of their entries. We would call particular attention to that paragraph, because we like to have as large a selection of photographs as possible so as to be able to choose from a wide variety of subjects when we come to publish our reviews of the show. True, we usually arrange to take our own photographs of selected subjects during the run of the show; but these cannot be published until some weeks later, whereas we have to make sure that *illustrated* reviews are available before the exhibition opens.

Good prints are essential, of course, and they should not be less than ¼-plate size (4¼ in. by 3¼ in.); larger sizes of prints are preferred. If readers are unable to make their own prints, we are prepared to borrow the negatives and to make the necessary prints from them. So, competitors, please do not forget to do something about the photographs.

The Bury S.M.E.E.

● WE HAVE been asked to announce that Mr. W. Heapy has been elected hon. secretary and treasurer of the Bury and District Society of Model and Experimental Engineers. All communications should be addressed to him, in future, at 282, Bolton Road, Bury, Lancs. Meetings are held every Thursday, 7.30 to 9 p.m., in the club's workshop at the Technical School, Broad Street, Bury, and Mr. Heapy will be glad to give any further information to enquirers.

Historic Locomotives Preserved

● THE RAILWAY EXECUTIVE has announced that two further examples of historic locomotives are to be preserved: the Western Region "Star" class engine No. 4003, *Lode Star*, and the former L.M.S.R. 2-4-0 engine No. 20002. This is good news indeed, for both engines are representative of historical "landmarks" in the history of the steam locomotive.

The 2-4-0 engine was originally designed by Matthew Kirtley for the old Midland Railway and was built at Derby in 1866; it is the last surviving example of the double-framed 2-4-0 passenger engine, examples of which were to be found on almost every railway, fifty years ago, and most of them lasted a very long while. No. 20002 is now 85 years old and was withdrawn from service only about four years ago, since when she has been stored at Derby, pending a final decision as to her fate.

Western Region No. 4003, *Lode Star*, is one of the two survivors of G. J. Churchward's epoch-making "Star" class of four-cylinder 4-6-0 express passenger engines built at Swindon for the old G.W.R. in 1907. It was the outstanding success of these engines that first established Churchward's reputation as a genius, and they laid the foundations upon which G.W.R. express passenger engine design has been built up ever since; moreover, they initiated certain principles of design which are now accepted generally as being essential for successful and economical working of simple-expansion steam locomotives.

Lode Star and a twin-sister, No. 4007, *Swallowfied Park* (formerly *Morning Star*) are, at the moment of writing, still in service, the only survivors of the original batch of ten; many of the later engines built from 1909 to 1922 are, however, still working as well as ever.

The M.E.T.A. Dinner

● THE MODEL Engineering Trade Association held a very enjoyable dinner and dance this month at the Charing Cross Hotel, some 55 members and guests attending. The president, Mr. George Dow, and the chairman, Mr. R. J. Raymond, between them kept the proceedings moving with just the right degree of hilarity.

Among the guests were the Rt. Hon. the Earl of Northesk and Lady Northesk, Mr. and Mrs. J. N. Maskelyne and a very welcome visitor from the U.S.A. in the person of Mr. W. K. Walthers, of Milwaukee, who, at the invitation of the president, contributed a brief speech in which, in humorous vein, he gave some impressions of the differences between Continental, American and British approaches to the model engineering hobby.

Lord Northesk, in his own inimitable manner which aroused considerable merriment, proposed the main toast of the evening and provoked an eminently suitable reply from the president. Mr. Raymond admirably maintained the prevailing light-hearted mood in his speech of welcome to the guests, on behalf of whom Mr. Maskelyne returned thanks.

Speeches over, the rest of the evening was devoted to dancing to music provided by an excellent band and in informal conversation. Members and their friends had come from the provinces and from Scotland to renew old acquaintances, make new ones and to take part in what can only be described as a most enjoyable function.

... Angels Fear to Tread

● WE HAVE received a letter from a well-known near-east port, the writer informing us that about a year ago he "picked up a copy of your 'M.E.' I have never made anything before, so I thought I would try and build something myself, so I had a go at your 'Juliet.' Unfortunately, the end of the boiler blew out as I tried her out. So I did start again; this time I did put a thread on the end and screwed it in ¼ in. then silver-soldered it. I then found that by doing it this way I could get a very high pressure under steam."

We do not doubt it! But this strikes us as being a novel form of boiler construction, though we would hesitate a long time before daring to recommend it, especially after what we regard as a more orthodox method of construction should have failed to produce a sound job. Or did it? We imagine that there must be many "Juliets" at work, and most of them are "first attempts" built strictly in accordance with the familiar "words and music," and we are certain that none has yet blown a boiler end out or is ever likely to, if the hydraulic test is properly applied!

Amateur Radio in 1898

● THE FIRST leading article in the first issue of THE MODEL ENGINEER (January, 1898) was entitled "The New Wireless Telegraphy: Some Interesting Experiments for Amateurs." The Editor of our esteemed contemporary, *Wireless World*, has recently conducted some research into the question of the publication of the first constructional article for a wireless set, and the first of which he had any knowledge was published in 1911, though there was some doubt as to whether this was the earliest. It was thought that there might have been one published about 1907. However, a reader informed him of the article published in THE MODEL ENGINEER, Vol. 1, No. 1, and the information naturally caused considerable astonishment.

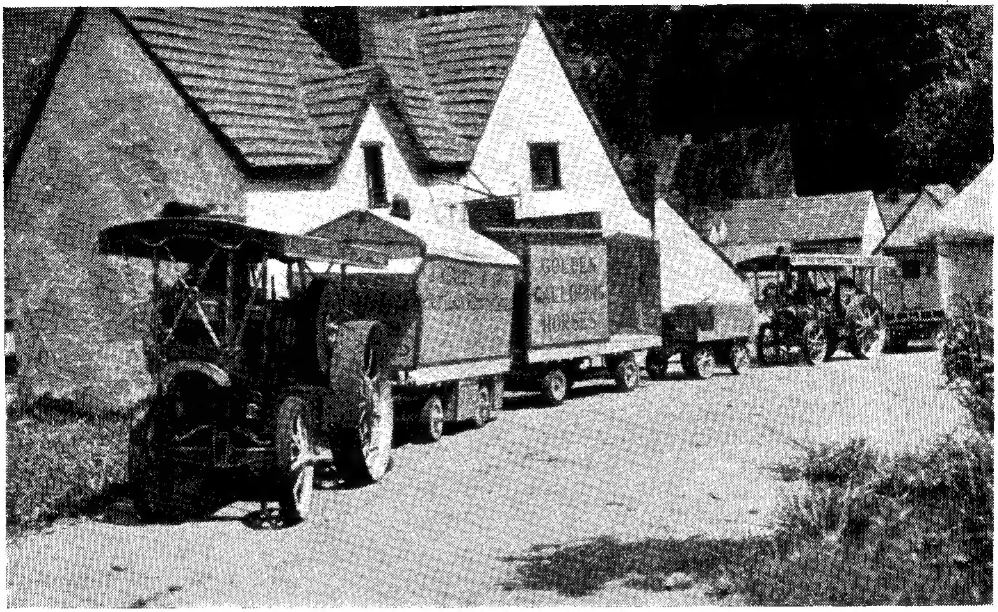
The May issue of *Wireless World* contains a reproduction of a diagram from the "M.E." article, accompanied by appropriate comment. The old article was not what we now regard as a purely constructional one, but it dealt in broad outline with the construction of transmitters and receivers, setting out details of several different arrangements.

We share our contemporary's interest in this matter, of course, and we are proud to think that THE MODEL ENGINEER can at least be counted among the technical journals which pioneered amateur interest in what has since become one of the greatest influences in the daily life of the community. But since the matter was brought to our attention, we have made some tentative enquiries of our own, and we have so far failed to discover any trace of the earlier publication of even a remotely constructive article on the subject for the benefit of amateurs. So, were we *really* the first?

THE BIG SHOW COMES TO TOWN

by Ken Wise

(*Photographs by F. J. Skeet*)



The Burrell " Victory " and Garrett " Little Wonder " with empty trucks outside " The Jolly Coopers." The drivers?—Inside " The Jolly Coopers "!

IN THE MODEL ENGINEER of July 6th, 1950, there was an illustrated article on the model village which my friend, Ray Palmer, built in his garden at Southampton. Ray and I are both keen model makers, my speciality being model fairs and circuses to the scale of $\frac{5}{8}$ in. to 1 ft.

In 1949, I suggested that a visit of my circus to the village would present a unique opportunity for photographing and so the circus was duly erected in the miniature farm meadow. Although the village is 1 in. to 1 ft., the " camera angle " did much to cover the difference in scale.

The model, " Paul Bros. Circus and Zoo," took some three years to build and comprises double entrance organ " front " folding out from a wagon, big-top tent supported by 70 poles including two king poles, ring, artistes' entrance with plush curtains, bandstand and band over, ringside seats in boxes, blocks of tiered seating and trapeze rigging with rope ladder. The menagerie consists of seven beast wagons containing lions, lion cubs, tigers, brown and polar bears, kangaroo, chimpanzees, monkeys and hippopotamus. There are also elephants, horses and ponies with the necessary tents, together with ring properties, pedestals, etc.

The transport fleet, painted red and yellow diagonally, totals 25 vehicles and includes a dummy " Foden " steam tractor, converted " Tilling Stevens " and other buses, lorries, motor tractor, beast wagons, packing trucks, and an office and living wagons with interior fittings.

When built up, the whole show is surrounded by its own red and yellow fencing, and totals some 600 parts, 350 of which make up the seating, and the outfit will " build up," " pull down " and pack completely on the wagons. The final effect is gained by the introduction of carved figures of ringmaster, clowns, artistes, and sundry personnel.

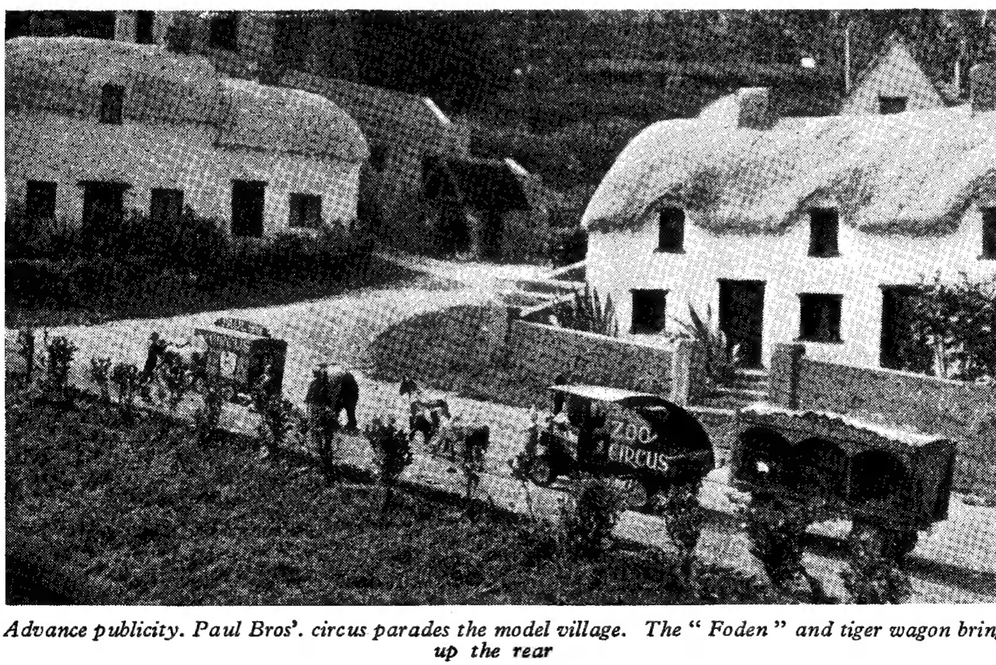
The circus visit was so successful that I " booked " the farm meadow for a return visit to the village, this time with my model fair; and so, on Sunday, July 16th, 1950, assisted by A. C. Durrant and N. S. Bryant, the " gaff," to use a showman's term, was built up.

This is a typical country fair and, therefore, very suitable for a village of this type. The main attraction is the three-abreast galloping horses roundabout, 18 in. in diameter, driven by an 8-volt motor housed under the dummy steam

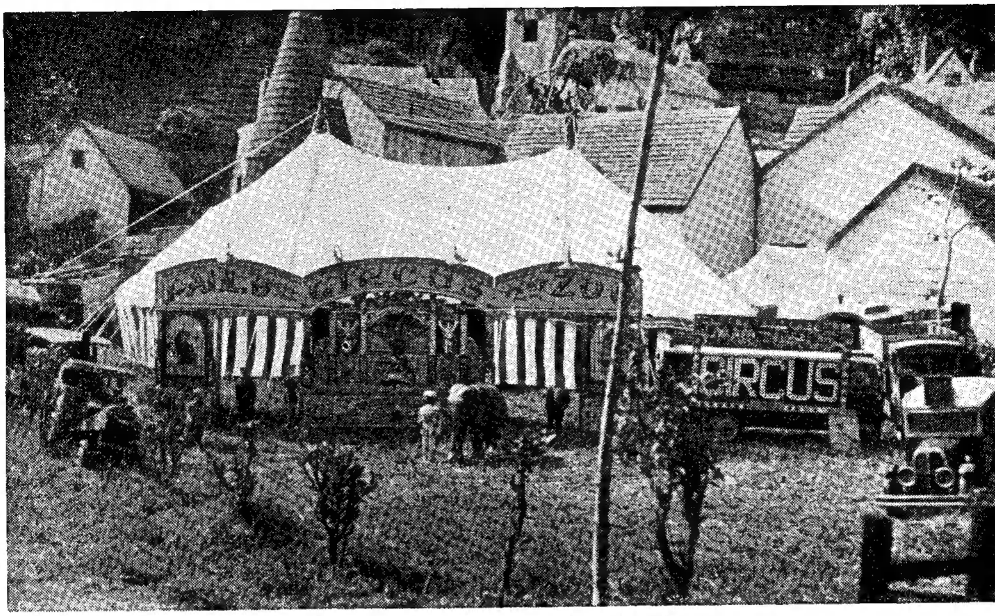
General view of the model fair layout from the side, with village buildings behind

centre engine mounted on the centre truck, organ with bandmaster beating time, 36 hand-carved horses in 12 sections, as prototype, supported on twisted brass rods. Galloping action is achieved by overhead cranks *via* a friction drive from the centre. The machine comprises 350 parts and packs into four loads "on the road," including centre truck and organ.

Supporting the "gallopers" are swinging boats and the following sideshows: two rifle ranges, darts, hoopla, skittles, roll-ups, rolling pennies and refreshment stalls, also an electrically-driven



Advance publicity. Paul Bros'. circus parades the model village. The "Foden" and tiger wagon bring up the rear

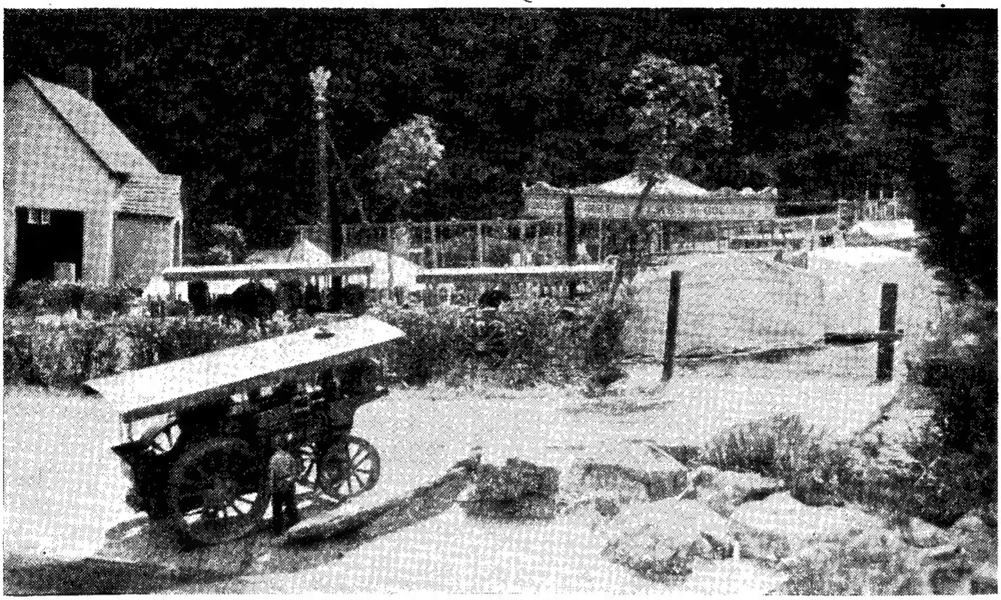


The Big Top, organ front, and various lorries, etc.

juvenile roundabout and a try-your-strength machine ; the last two items and one of the rifle ranges are the work of N. S. Bryant.

The fair, like the circus, can be packed in the proper manner and made up into the familiar road trains headed by traction engines (now, alas, not so familiar), together with the necessary internally-fitted living wagons and the inevitable tank wagon or " dandy." Three traction engines are used, a " Burrell " and two " Garretts," one of the latter being the property of N. S. Bryant. Although the tractions are dummies and intended for effect only, the " Burrell " is fitted with an electric motor and drives the

" With roundabouts turning to left and to right." Close-up of " the gallopers " and juvenile ride



The Garrett "taking water" with the "Gaff" in the background

"dynamo" off the flywheel, rocking realistically while doing so.

The final touch of realism is added by carved figures of showmen and public, some riding the roundabout, and by playing records of fairground organs through a concealed loudspeaker.

The fair represents approximately five years' work and, like the circus, was made from scrap metal, plywood, and such odds and ends that could be pressed into service. Data was obtained from photographs, observation and measurement of the real thing. Obviously, in models of this type, paintwork is of the utmost importance and there is great scope for those who are artistically-minded.

I am greatly indebted to Ray Palmer for his co-operation which enabled me to secure what I think must be unique photographs of a miniature fair and circus in a model village. Another view is shown on the cover of this issue.

An Early "Fowler"

ADVERTING to the illustration in "Smoke Rings" for December 14th last, we have just received an interesting letter from the Rev. R. C. Stebbing, a Gloucestershire reader of long standing. He has sent us this extract from Fletchers' *Steam on Common Roads*: "At the Wolverhampton show of the R.A.S.E. in 1871 Messrs. Fowler exhibited two twelve horse-power road locomotives . . . one . . . fitted with Aveling and Greig's wheels, with indiarubber tyres in segments . . . mounted on three rigid wheels, the front wheel turned in a ring, supporting the weight of the forward part of the engine either by a number of balls or by rollers, the forecarriage thus formed being steered by means of a worm, worm wheel and pitched chain. This engine was provided with a single cylinder, completely steam jacketted and lagged, and combined with a spacious dome . . . A tank under the boiler barrel was provided, while all the moving parts were cased in . . ."

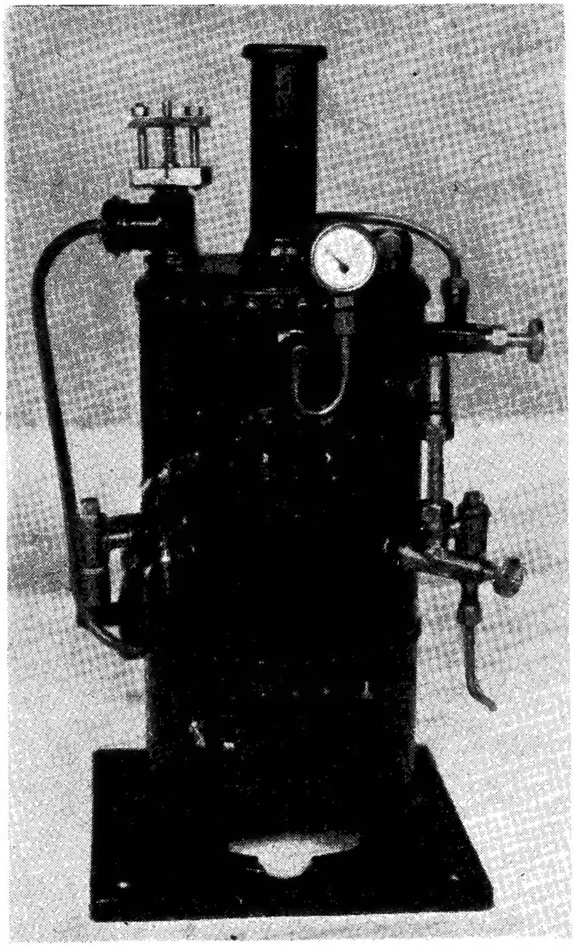
Mr. Stebbing points out that the cylinder of the Cheadle engine seen in the illustration referred to is typically Fowler.

The description quoted certainly seems to apply exactly to the Cheadle engine, and we are now quite prepared to believe that it was a Fowler product. Mr. J. M. Ball, who lent us the original print, thought that the photograph had been taken 70 to 75 years ago; that would mean about 1875, so, on this point there is a fair agreement with Mr. Stebbing's quotation, in that the date is clearly in the 1870's. We wonder if any reader can produce more convincing evidence either to deny or confirm our deductions.

A SMALL VERTICAL BOILER

by H. E. Rendall

SOME little time ago I was asked by a friend to make a small vertical boiler for his nephew. Obviously, a perfect scale model was not required, but all the same we wished to have a fair resemblance to the more or less classical boiler of Victorian days, and the photograph shows the result of my labours. The size of the boiler was settled by what I happened to have available, i.e., 7 in. of 3¼-in. copper tube, a length of ¾-in. tube for the single flue and two pieces of 13-gauge copper plate.



The copper end-plates are flanged outwards for the flue-tube and inwards for riveting to the boiler shell. For this purpose I used two formers, one bored centrally ¾ in. and the other of a lesser diameter. The first operation with the copper plates was to drill a ⅜-in. hole in the middle, then drive through a series of " dollies," i.e., short steel rods with tapered ends, each being a $\frac{1}{16}$ in. greater than the previous one, up to the diameter of the flue. The first was, therefore, $\frac{7}{16}$ in. diameter, then ½ in., etc. I annealed the plate between each drive, but I think it would have been quite in order to have annealed after every second dolly. If this method is not approved, an angle ring joint, as shown in Fig. 1, may be used. After the flue pipe flange was completed, the copper plate was sandwiched between the two formers, and a mandrel put through to ensure that the outer flange would be exactly concentric with the flue flange. It was all a simple and easy operation.

As the w.p. was settled at 35 lb., an hydraulic test of 100 lb. was considered sufficient and a steam test of 60 lb. This allowed me to caulk the joints with soft silver-solder. The exception is the top of the flue-tube, which is brazed with brass spelter, as this was always a rather weak point in the single-flue boiler. Some makers fitted a plate inside the flue to protect this joint from overheating, and others even went so far as to line the whole length of the flue with insulating material. These precautions were by no means unnecessary, as if the boiler were forced, this joint might easily become red hot.

The flue-tube, being already fitted to the top plate, prevented the use of a riveting stake for holding up the rivet heads, so I had to use tight-fitting copper screws. To produce these I made a running-down cutter of silver-steel, and this proved a good investment. The thirty-six 7-B.A. screws were quickly and easily made. As each screw was turned and threaded it was screwed in really tight, sawn off from the length of copper rod and the head hammered over to look like a rivet, but this latter operation should be postponed until the top-plate has been sealed by solder. There is no difficulty in riveting the lower plate, and the flue-tube can be expanded by one of the dollies. The top and bottom plates are stayed together by 5/32-in. copper rods.

I have no intention of bursting into propaganda

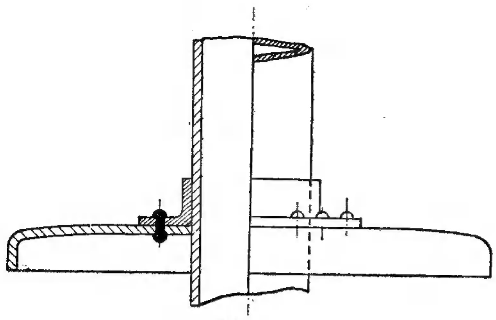


Fig. 1

on behalf of the rivet-and-solder boiler. In this particular case, where all the joints can be made a good fit, there is little that can be said against it for pressures up to 80 lb. Many rivet-and-solder boilers of a less easy construction have boiler and the blower in this size should have a tiny little cock with a $\frac{1}{16}$-in. pipe, but I doubt if it would last very long. The man-hole door was usually just above the fire door, and about the same size. Almost all the model vertical boilers I have seen have had an angle steam-valve on the top, but this arrangement was not found in full-size practice, for the obvious reason that it was out of convenient reach of the engine man. The usual arrangement was to have the steam pipe flanged to the safety-valve fitting or coming directly out of the top of the boiler. The safety-valve fitting might be on top of the boiler, or, as there was plenty of steam space, it might be at the side. The regulator or stop-valve was about halfway down the steam pipe. In this boiler the steam pipe is led down to the fire level and is looped within the firebox to form a superheater. Thence it passes to a twin stop-valve unit with attached displacement lubricator. One stop-valve controls its own winch engine, the other enables steam to be supplied to any other engine.

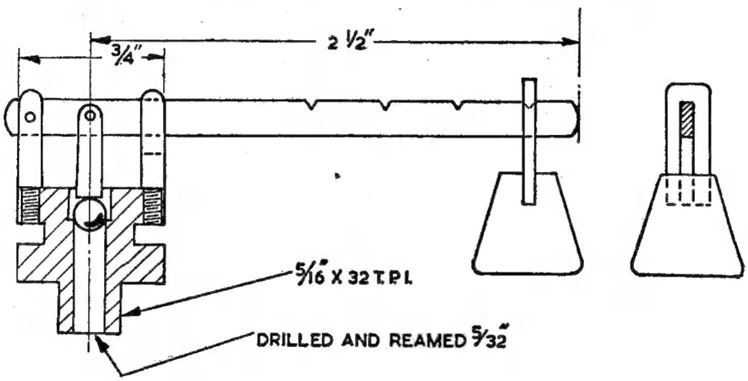


Fig. 2

given good service, and nowadays we have the advantage of solder paints, that will give a good sound tinning, and, above all, soft silver-solder. This is not often mentioned in THE MODEL ENGINEER. It is made of various alloys of lead, tin, cadmium and silver. The grade I use is a good quality tinman's solder with added silver. It has a melting point about twice as high as ordinary soft-solder and the silver seems to give it great fluidity. With the help of a small gas blowpipe it penetrated everywhere and sealed up every chink.

The boiler fittings are mostly taken from the "Live Steam" notes and are frankly oversize for this boiler, but it is difficult to guarantee reliability if they are made smaller. A very usual arrangement was to have the water gauge on the right, about halfway down the boiler, two test cocks on the left, one at working level height, the second below. The feed check-valves were very insignificant little fittings on the full-size

Personally, I would have preferred a weight and lever safety-valve, but I was asked to fit a spring-valve, and did so. Both types were used in full-size practice, but if a spring-valve was fitted it was usually of the spring-balance type, and not a direct-loaded valve as shown. A

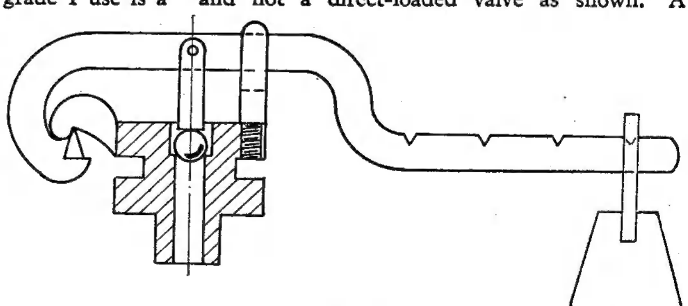


Fig. 3

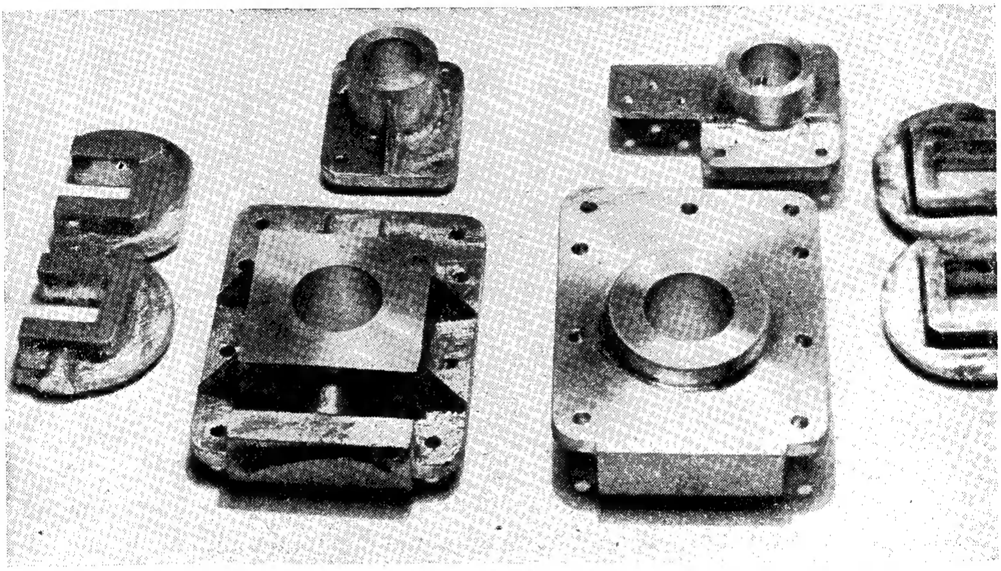
larger boiler would often have a Ramsbottom type of safety-valve. Fig. 2 shows a valve, which has given consistently reliable service on a small boiler for twenty years. I made it originally from

(*Continued on page* 664)

The Allchin "M.E." Traction Engine

by W. J. Hughes

THE design of the boiler for our $1\frac{1}{2}$-in. scale traction engine is almost complete, but for various reasons it may not be possible to make the tracing and to have the blueprints available for some little time yet. In view of the position of the metal market, however, I have prepared a list of the copper which will be required to build the boiler, so that those who have some in stock will know what to save, and those who have a possible source of supply will be able to make suitable arrangements.



Some of the partly-machined castings for the Allchin ; these are the bearing-brackets for the four shafts

The boiler barrel is $3\frac{3}{4}$ in. outside diameter, by $7\frac{13}{16}$ in. long, by 13-gauge ; or you will require the corresponding amount of 13-gauge sheet to roll to that diameter. There are 19 fire-tubes $\frac{3}{8}$ in. diameter by 20 or 22-gauge (solid-drawn) by 8 in. long—no superheater flues required on a traction engine! The firehole ring requires $\frac{3}{4}$ in. of tube $1\frac{5}{8}$ in. o.d. by 10-gauge, or again this can be rolled from sheet ; the smokebox tube-plate is also of 10-gauge sheet, and is $4\frac{1}{2}$ in. diameter. Another piece of 10-gauge copper, 6 in. by $4\frac{5}{8}$ in., is needed for what our locomotive-building brothers call the backhead, but which we shall call the boiler-front, in true traction and portable-engine parlance.

The rest of the copper sheet required is of 13-gauge, as follows: firebox outer wrapper, 14 in $\times$ $4\frac{5}{8}$ in. ; firebox tube-plate, $4\frac{3}{4}$ in. $\times$ $3\frac{7}{8}$ in. ; ditto door-plate, same size ; ditto wrapper, $11\frac{3}{4}$ in. $\times$ 4 in. ; throat-plate, $3\frac{1}{2}$ in. $\times$ $4\frac{7}{8}$ in. ; girder stays (2 off), $2\frac{5}{8}$ in. $\times$ 4 in. ; crown stays (2 off), $1\frac{1}{8}$ in. $\times$ 4 in. ; joint ring, $\frac{3}{4}$ in. $\times$ $6\frac{5}{8}$ in. ; cylinder reinforcing plate, 3 in. $\times$ $3\frac{5}{8}$ in. ; and motion bracket reinforcing plate $\frac{3}{4}$ in. $\times$ $1\frac{1}{2}$ in.

For the foundation ring, $\frac{1}{4}$ in. square section copper is required: two pieces $3\frac{5}{8}$ in. and two pieces $4\frac{1}{8}$ in. long. There are four longitudinal stays, $12\frac{1}{4}$ in. long and $\frac{3}{16}$ in. diameter, and for the front and back firebox stays about 15 in. of $\frac{1}{8}$ in. diameter copper rod is needed. The firebox side-stays are hollow, and will be made from 2 ft. 3 in. of $\frac{1}{4}$ in. diameter copper rod, or $\frac{1}{4}$ in. o.d. by 13-gauge copper tube. (All the stays except the longitudinal ones can be made from odd lengths, of course).

Oh yes! and there's the smokebox packing ring, $\frac{3}{8}$ in. $\times$ 12 in. $\times$ 13-gauge.—nearly forgot that!—and the priming-baffle $1\frac{3}{4}$ in. $\times$ $3\frac{1}{2}$ in. $\times$ 16- or 18-gauge. And if you are rolling the barrel from sheet, a strap 1 in. $\times$ $7\frac{1}{2}$ in. $\times$ 13-gauge.

You'll also need some round-headed rivets 3/32 in. diameter—four or five dozen iron ones $\frac{3}{4}$ in. long and two or three doz. each of copper $\frac{3}{8}$ in., $\frac{1}{2}$ in. and $\frac{3}{4}$ in.

May as well mention the smokebox too while we're at it, though this is steel, not copper. It is $4\frac{1}{8}$ in. o.d. by 13-gauge $\times$ $2\frac{5}{8}$ in. long, and, of course, can be tube or sheet. Copper would not be suitable, as it has to take all the stresses and strains of the fore-carriage.

Castings

Just before the ban on gunmetal castings came

into being, I received my first batch of castings from friend Reeves. Apart from one or two minor points which have now been corrected, they were just what the doctor ordered, both as to size and machining allowance. Incidentally, they do machine nicely ; [redacted] of them are shown in the accompanying photograph.

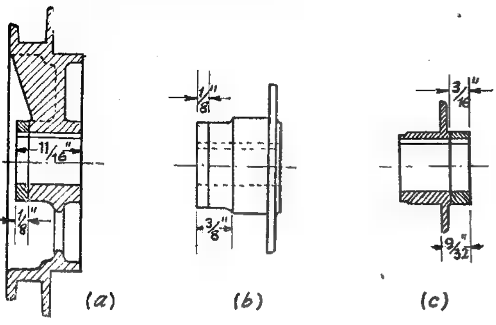


Fig. 1. The above figures give the additions required to (a) the brake-drum and centre for second-motion spur-wheel (b) the centre for second-motion pinion, and (c) the third-motion pinion. All dimensions, except those given above, remain unaltered

In some ways the ban on gunmetal has put the domestic feline among the dove-cotes, but not entirely, for many of the castings we require will be just as satisfactory in cast- or malleable-iron. So if Bro. Reeves sends you, say, iron bearing brackets where the blueprint specifies gunmetal, don't hurl them back at his head with epithets and imprecations, because they'll do just as well in iron. Of course, experienced chaps will know that, but tyros are often afraid to deviate one jot or tittle from the written word, for fear of falling up to the neck in the gumbo. I know, I've been one myself! (In fact, strictly on the q.t., I sometimes wonder how far I've proceeded from the tyro stage, especially when I make a 'norrible bloomer in the workshop!)

Alterations in Design

For reasons which would take too long to explain, I am making a few adjustments to the design of shafts and bearing brackets, of which those who have started work already should take careful note. (Future blueprints and castings will have been altered, of course!) I am sorry if this causes [redacted] spot of bother for a few people, but the discommodation will not be heavy, because parts already machined can be used, and castings already made or purchased can be worked in.

For example, the bosses on the brake drum and the centre for the second motion pinion are extended inwards by $\frac{1}{8}$ in. All that need be done here is to turn washers up $\frac{1}{8}$ in. thick and [redacted] bare $\frac{7}{8}$ in. in diameter : these will take up the space (Fig. 1, [redacted] and *b*). Similarly, the boss on the centre for the third motion pinion is to be extended inwards for $\frac{3}{16}$ in., and here [redacted] spacing washer $\frac{3}{16}$ in. thick $\times$ $\frac{3}{4}$ in. diameter will be required (Fig. 1*c*).

The outside spigots of the bearing brackets for the hind axle are to be extended also : the L.H. one by $\frac{3}{16}$ in., and the R.H. one by $\frac{1}{8}$ in. Again washers of $1\frac{5}{16}$ in. diameter $\times$ $\frac{3}{16}$ in. and $\frac{1}{8}$ in. respectively will do the needful.

There now remain the shafts, which need altering to match. For the hind axle, you could turn [redacted] sleeve $\frac{5}{16}$ in. long and $\frac{3}{4}$ in. diameter to press over the R.H. spigot, and extend that end by $\frac{5}{16}$ in. in the manner sketched (Fig. 2). The third shaft can be similarly extended at either end, if material is short ; the second shaft is extended at the R.H. end only. In actual practice none of these extensions is *really* necessary

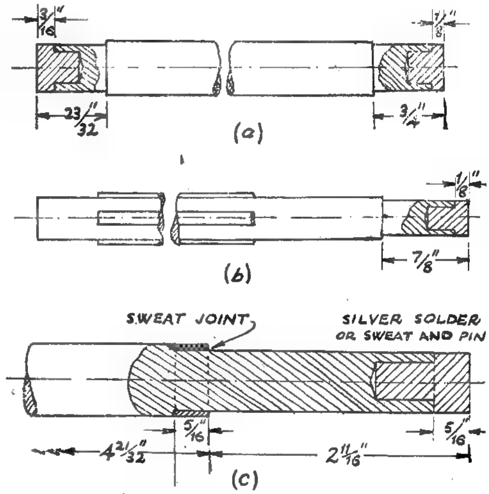


Fig. 2. Additions required to the shafts. (a) at each end of the third shaft ; (b) at the right-hand end of the second shaft ; (c) at the right-hand end of the hind axle

(except for the hind axle), but if not added, the appearance will suffer. Of course, if you haven't turned the shafts already, they should be machined to the new dimensions and not the old. Or if you can spare the material, it will be better to make new shafts altogether ; I have only suggested the alterations for those whose material and/or cash is short!

A Small Vertical Boiler

Continued from page 662)

[redacted] design given in THE MODEL ENGINEER many years ago, but Fig. 3 shows [redacted] more correct design. It will be noted that the lever pivot, valve seating and weight suspension are on a straight line. A knife-edge joint replaces the pivot pin which might rust and seize up. In both designs the lever is steadied by [redacted] slotted rod.

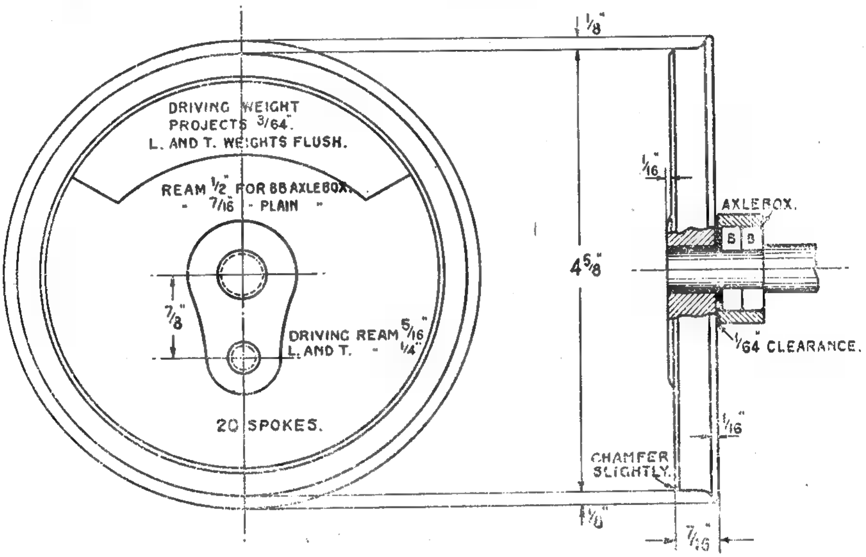
The boiler is fired by [redacted] home-made gas burner, which has to be kept low until there is sufficient steam to make the blower effective.

"Britannia" in $3\frac{1}{2}$-in. Gauge

by "L.B.S.C."

THE coupled wheels on the full-sized engines are of the L.M.S. type, with triangular rims and oval spokes, pretty much the same as specified for *Doris*. The driving balance weights would delight the heart of our old friend "Bill Massive," being huge affairs projecting beyond the wheel rims. The weights in the coupled wheels are not quite so ponderous, being flush, and are offset ■ little. This need not worry any builders of the small edition; our approved advertisers who are supplying castings, will ■■ that the weights ■■ all Sir Garnet. All you need bother about, is getting the wheels turned all to the same diameter and width. Full instructions for turning wheels, were given in the *Tich* notes, yet I constantly receive letters from new readers asking for particulars of how to do the job. Well, I've had to close down the Curly Correspondence College of Construction, as it never allowed me any time to do a little locomotive-building in my own workshop; so here is ■ brief synopsis of the sequence of operations.

Chuck the wheel in the three-jaw, back outwards, and set to run ■■ truly as the casting will allow. Grip by the tread, leaving just enough of the flange, clear of the chuck jaws, to allow same to be trued up. Face off back and boss with ■ round-nose tool set crosswise in the rest. After taking roughing cut, centre, drill through 31/64 in. or 27/64 in. according to whether you are using ball-bearing axleboxes, or plain ones; ream $\frac{1}{2}$ in. or $\frac{7}{16}$ in. respectively. Then take the finishing cut, and true up the flange. If your three-jaw won't hold the wheel—a four-inch chuck should take it in the top steps, ■■ they usually grip when extending beyond the chuck body—you'll have to bolt the wheel casting to the faceplate, with bolts between the spokes, and three pieces of parallel packing between the casting and the faceplate. Pieces sawn off ■ length of mild-steel bar about $\frac{1}{4}$ in. thick, would do fine, as they would be near enough parallel.



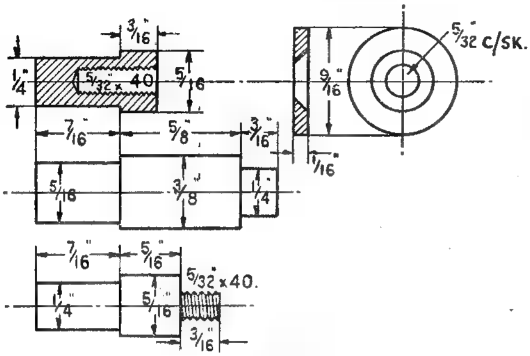
Details of the coupled wheels

Reverse in chuck, and face the rim and boss. Turn the face of the rim first, then the boss, which projects $\frac{1}{16}$ in. beyond the rim. The driving balance-weight should project about 3/64 in. beyond the rim; the others are left flush. The rebate which shows the joint between wheel and tyre on the full-sized engine—at the edge of the spokes, NOT in the face of the rim—is put in by a parting tool set crosswise in the rest. It is shown in the illustration by a double line, and cuts right across the outer edge of the driving-wheel balance-weights.

A Faceplate Tip

Locomotive builders who have to use the faceplate for wheel turning, ask for an easy way of centring the wheels quickly, when reversing to turn the rims and bosses. The way I used to do it, was simplicity itself. In the days now long past, when I only had ■ pedal lathe and ■ hand-

driven bench drill, I had a very good friend who was employed at a large engineering works. Most of the drills they used, were of the taper shank kind; and when either broken or worn, the drills were thrown away. My friend picked up some shanks off the scrap-heap for me, with various sizes of drill stumps attached. Incidentally, when he asked the foreman if it would be all right to take them, that worthy promptly



Crankpins

replied: "Take the whole bluepencil lot if you like, it'll save us the trouble of getting them carted away!" Times have changed; I recently heard of a boy who begged a small piece of steel plate from the scrap-pile of a well-known firm, to make a pair of *Tich* frames; and all he got was a curt refusal. What encouragement! However, the lathe I had at the time, an old 3½-in. Drummond, had a No. 1 Morse taper hole in the mandrel; so all I had to do, to get a new centring-pin, was to stick a shank containing the broken or worn end of a drill of the required size, in the centre-hole, and slide my wheel over it. The improvised peg held the wheel perfectly true, whilst the bolts and distance-pieces were put on.

The stub ends can, of course, be ground away so that they only project far enough from the faceplate, to do the actual centring, and not interfere with the facing. Centring pegs can also be made from mild-steel; turn the taper first, then stick it in the mandrel nose, and turn the outer end to the right size to slide nicely in the hole in the wheel. A small peg can be used to centre larger holes than its own size, if a few bushes or sleeves are made to fit over it.

How to Get the Treads all the Same Diameter

Chuck an old wheel casting, iron disc or something similar, a little smaller than the wheel, and face it off, recessing the centre about 1/32 in. deep for about 1½ in. diameter. Centre, drill and tap $\frac{9}{16}$ in. or ⅝ in., any fine thread, and screw in a stub of steel, leaving about 1 in. projecting. Turn about ⅝ in. of this to ⅜ in. diameter, screw it and fit a nut. Turn the plain part to a nice sliding fit in the hole in the wheel. Mount each wheel in turn, and turn the tread and flange to about 1/64 in. over finished diameter. The friction between the wheel back, and the improvised "faceplate," will be ample to prevent the wheel slipping on the pin; and don't tighten the nut sufficiently to distort the wheel. When the last one has been rough-turned thus, leave it on, regrind the tool, and take your finishing cut. Don't shift the cross-slide, but finish-turn all the rest, at the same setting. They will then be all exactly the same diameter—they just can't help it! The flanges can be rounded off by applying a file to them whilst the lathe is running slowly.

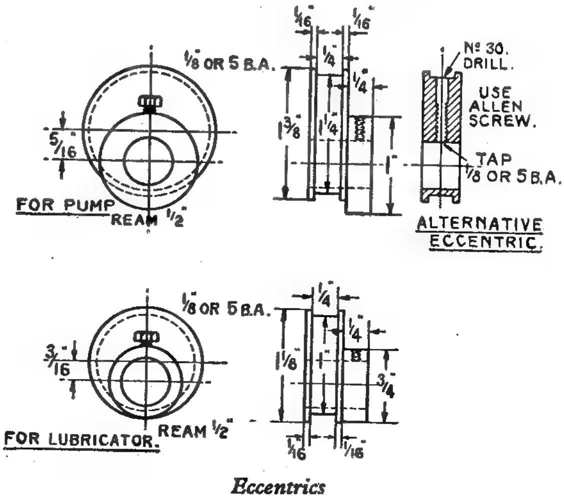
Note.—A posh finish on the treads is about the last thing in the world that is needed. Leave any toolmarks in; they will help the wheels grip the railheads better. Let the rails themselves do any smoothing-off that is required, as they will automatically do it at the correct angle.

If the treads have been rough-turned on the lathe faceplate, they must be finished off in the same manner; and this is easy enough if the centring peg is used. The only difference is, that it takes longer to tighten up the bolts between the spokes, than it does to tighten the nut on the peg of the improvised "faceplate."

Crankpins

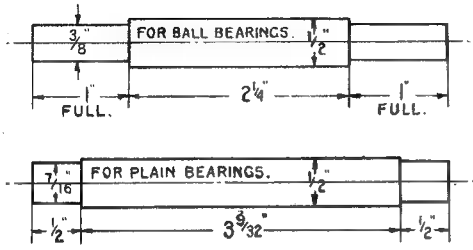
The holes in the wheel bosses for the crankpins are drilled by aid of a jig, which—for new readers' benefit—is a piece of ⅜ in. × ¼ in. flat steel bar about 2 in. long, with two holes in it at ⅞ in. centres. One carries a peg, which should fit nicely in the hole in the wheel. The other is 15/64 in. diameter. Scribe a line down the centre of each wheel boss. Put the peg in the hole, adjust jig until you can see the scribed line passing across the bottom of the 15/64 in. hole, then clamp the jig to the wheel, and poke the 15/64-in. drill through the lot. Ream the holes in leading and trailing wheels with ¼-in. reamer; open out those in the driving wheels to 19/64 in. and ream $\frac{5}{16}$ in.

The crankpins are turned from silver-steel, ⅜ in. for driving pins, and $\frac{5}{16}$ in. for the others, leaving the working surface in the "natural"



Eccentrics

state. Chuck in three-jaw, and use a knife tool to turn the spigots to a press fit in the reamed holes in the wheel bosses. I've dilated so much on the easy way to get press fits, that repetition here is just superfluous ; but I'd like to remind inexperienced workers, not to overdo it, and split the bosses when pressing in. There is a medium in all things, and what you need is, as Chu Chin Chow would remark : "Plentee muchee squeezee, but no bustee." The bench vice, used with discretion, makes a nobby press.



Coupled axles

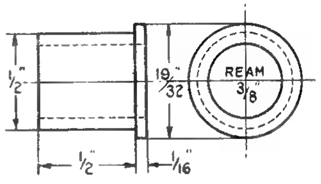
Eccentrics

Two eccentrics will be required, one for operating the boiler feed pump, and one for the mechanical lubricator. I made my pump eccentric from a piece of cast-iron parted off the end of a chuck-back casting, the boss of which was too long. Probably our advertisers will be able to supply castings in iron, for the eccentrics, with a chucking piece cast on, like a cylinder cover. This can be gripped in the three-jaw, and the groove machined out with a parting tool ; then part the eccentric right off the chucking-piece. The true centre will be indicated on the parted side, by the toolmarks ; set out the eccentric centre from this ($\frac{5}{16}$ in. or $\frac{3}{16}$ in. as the case may be) centre-pop it, chuck in four-jaw with the pop-mark running truly—plenty easy if you run up the tailstock centre for a guide—drill a $\frac{1}{8}$-in. pilot hole through, open out to 31/64 in. and ream $\frac{1}{2}$ in. To turn the boss, simply mount the eccentric, boss outwards, on a stub of round rod held in three-jaw and turned to a tight fit in the hole through the eccentric. Each boss is drilled and tapped for a $\frac{1}{8}$-in. or 5-B.A. set-screw, as shown.

The eccentrics could be turned from round mild-steel of suitable diameter, such as odd ends of cold-rolled shafting. Chuck in three-jaw, turn groove, and part off enough to allow for boss. Mark off and drill the hole for shaft, exactly as described above ; then mount on a stub mandrel, and turn the boss. Alternatively, the boss may be dispensed with altogether, and a No. 40 hole drilled through the thickest part of the eccentric, into the axle hole. The upper half of this is opened out with No. 30 drill, and the lower half tapped $\frac{1}{8}$ in. or 5 B.A. for a set-screw, which for preference should be of the Allen type.

Axles

Builders who are using plain bearing axleboxes, can go ahead and turn the coupled axles as given in the accompanying illustration ; and as the job is the same as described for *Tich*, there is no need to elaborate on it. Press one wheel on each axle, put on an axlebox, then the eccentrics (pump eccentric on the driving axle, and lubricator on the leading axle) then the other axlebox, and then the other wheels, which can be quartered with square and scribing-block, or any other means that you fancy, and pressed right home. I usually quarter the driving wheels only, by aid of square and scribing-block, and set the others



Wheel bush

to a pair of dummy coupling-rods ; a method which did the doings in two wags of a dog's tail on my own little *Britannia*. If the ball-bearing axleboxes are used, a little bit of jerry-wangling will be called for, the reason being as follows :

The ball-bearings only have a $\frac{3}{8}$ in. hole through them ; and as the ends of the axles have to pass through, before entering the wheels, the wheel seats cannot be any bigger in diameter, and there will be no shoulder against which to press the wheel bosses. On top of that, there will be $\frac{1}{16}$ in. of unsupported axle between the wheel boss and the outer ball-bearing ; so that if her nibs goes sweeping around a curve at a "scale" 120 m.p.h. with the equivalent of 1,000 tons behind her tail (a job which wouldn't worry her in the least) and the leading coupled wheel happened to hit a crossing frog or some other obstruction—even a wide joint might do it—the whole of the strain would take effect at the weak place, and she would soon develop more "wheel wobble" than a car whose driver is everlastingly hitting the kerb with his front wheels, like the tailor who used to live opposite my old home at Norbury. On my own engine, I got over the trouble in the following manner. You'll have noticed that I specify $\frac{1}{2}$-in. holes in the wheel bosses, if ball-bearing boxes are being used. These are to acommodate bushes made from $\frac{5}{8}$ in. round mild-steel rod, as shown. Chuck the rod in the three-jaw, face the end, centre, and drill down about $\frac{5}{8}$ in. depth with 23/64-in. drill. Turn down about $\frac{5}{8}$ in. of the outside to 19/32 in. diameter, so that it will just clear the $\frac{5}{8}$ in. recess in the axleboxes. Next, turn down $\frac{1}{2}$ in. length to a press fit in the hole in the wheel boss ; part off at 3/32 in. from the shoulder, reverse in chuck, skim the flange to $\frac{1}{16}$ in. in thickness, and poke a $\frac{3}{8}$ in. parallel reamer through, using slow speed and a drop of cutting oil. Squeeze a bush into each wheel, with the flange on the inside.

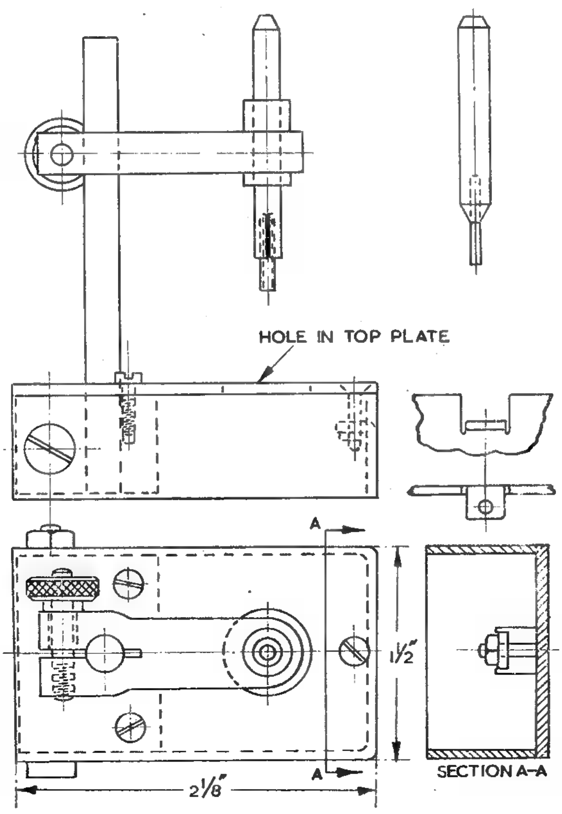
Turn the axles from ½-in. round mild-steel, to the given dimensions; the reduced part at each end should be a tight push fit in the ball bearings, which, on my own engine, were a dead ⅜ in.

The assembly is then made in much the same way as with the plain bearings; put the ball-bearing axlebox on the reduced part of the axle, and squeeze the wheel on. I found that pressing the bushes into the wheels, just reduced their internal diameter enough to make the wheels a lovely press fit on the portion of axle projecting beyond the axlebox; the flange goes into the recess, and clears the ball-bearing by a bare 1/64 in. The section shows the whole bag of tricks assembled. Press home all three wheels on one side, then put on the other driver, quarter it, and press right home. My dummy coupling-rods were made from a bit of ½ in. × 3/32 in. brass strip, drilled clearing size for the crankpins. The remaining leading and trailing wheels were pushed on by hand as far as they would go, with the axleboxes temporarily in place in the frames; the rods were put on, wheels adjusted until the crankpins went through the holes, then each pair taken out, and the wheel pressed right home. Net result, O.K., the wheels spinning freely with the dummy rods on.

A Handy Punch Holder

by R.H.F.

THE tool shown in the sketch is a useful addition to the home workshop and it will, to some extent, take the place of a "third hand" we all wish we had sometimes. It is designed to hold any kind of punch in an upright position and leave the hands free to hold the work and apply force in the usual way. It is particularly useful when dismantling or assembling small pivots or bushes to wheels, etc., and avoids risk of damage to delicate parts. It can also be used for small broaching operations and piercing holes in thin spring steel, etc. The example shown was made up from bits and pieces, as I had no means of machining the base from solid material, and consists of a brass block reamed to take the ¼ in. dia. silver-steel pillar and also cross-drilled and slotted for clamping; a piece of flat steel, about $\frac{1}{16}$ in. thick, is bent to form a three-sided box and a top plate 3/32 in. thick. These are secured together as indicated, and, of course, it is essential that the pillar and punch body bush in the end of the beam is square to the top plate. The punch bodies of $\frac{3}{16}$-in. silver-steel are a nice slide fit in the bush, the one shown in position being accurately drilled at the lower end to take various sized hollow inserts; it is split and provided with a clamp ring (not shown) to hold them in place. The inserts range from about 0.025 in. bore upwards and in making these small ones, it is best to drill a larger hole nearly through and then break through with the size required. A bolster with various sized holes in it and any convenient arrangement for clamping to the base, plus a 60-deg. cone-shaped insert for centring a hole under the punch, completes the set-up. Solid pin inserts can be used in place of the hollow ones when convenient, but I have found it quite a good idea to use piano wire inserts for small pin punches, as they withstand considerable ill-use, and no heat treatment is necessary. The punch bodies can be drilled slightly larger than the wire and insert sweated in. The projected sketches reproduced herewith will I hope, enable other readers to construct a similar holder, but dimensions can be altered to suit.

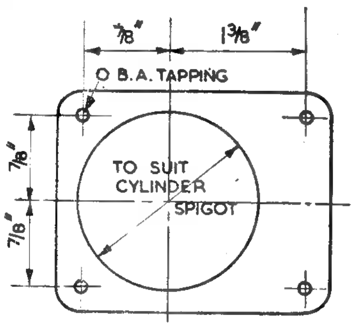


PETROL ENGINE TOPICS

*A 50-c c. Auxiliary Engine

by Edgar T. Westbury

IN drilling the clearance holes in the cylinder base flange, and the corresponding tapped holes in the top surface of the crankcase, to take the holding-down studs, some difficulty may be found in locating them sufficiently accurately to mate up without any trouble, as it is not practicable to "spot" the tapping holes through the clearance holes in this case. Careful marking out, with the aid of the scribing block, is helpful in this respect, but a much more positive method



Detail of jig plate for drilling holes in cylinder base and crankcase

is to make a simple jig from steel plate about $\frac{1}{8}$ in. thick, which can be applied to each of the components in turn to locate the holes.

The plate is first filed up truly rectangular, and to the same size as the cylinder base flange, and is then marked out and bored to the same size as the aperture in the crankcase, or in other words, to fit the cylinder spigot. Using this bore as the reference surface, the positions of the four holes are marked out, pilot drilled and opened out to the tapping drill size. Identification marks should then be made to show clearly the top and bottom sides of the plate.

For drilling the cylinder base, the plate is placed over the cylinder spigot and clamped to the flange with two toolmaker's clamps, the surface marked "top" being in contact with the flange. The four holes can then be located from the jig-plate, and afterwards opened out to clearance size for the studs. In the case of the crankcase, the "bottom" surface of the plate is placed against the machined seating, and located by a plug machined to fit exactly in the centre hole, which should preferably be made with an enlarged rim and drilled through the centre, so that it can be used in conjunction with a bolt and bridge-piece, to clamp the plate to the crankcase.

*Continued from page 613, "M.E.," May 10, 1951.

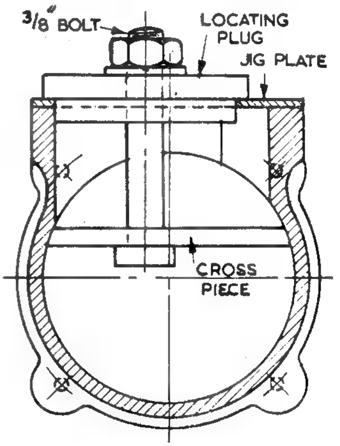
The remainder of the holes in the cylinder are the tapping holes for securing the cylinder head, transfer port cover, and exhaust pipe, which can all be "spotted" from their mating parts, and thus present no difficulties in their proper location.

Connecting-Rod Clearance

It will be found necessary to cut a slot $\frac{1}{2}$ in. wide at the base of the cylinder to clear the connecting-rod at the point of maximum angularity. The detail drawing of the cylinder shows this slot on the exhaust side, but this is an obvious error, as the desaxe location of the cylinder which displaces it towards the exhaust port, makes it necessary to cut the clearance slot under the transfer passage. This slot may be milled if desired, but as it calls for no high precision, either in location or shape, filing is quite sufficient.

Cylinder Lapping

After all operations on the cylinder, including the drilling and tapping of holes as shown on the detail drawings, are completed, the bore surface should be lapped to correct minor inaccuracies and produce as high a finish as possible. I have given particulars on several previous occasions of



Method of locating and clamping the jig plate on crankcase

the method used in cylinder lapping and other writers have also contributed to the information available on this process.

I always recommend the use of adjustable laps, made of some material softer than the surface to which they are applied, such as copper or aluminium. Lead laps are still more efficient, but not so easy to control when working to fine limits.

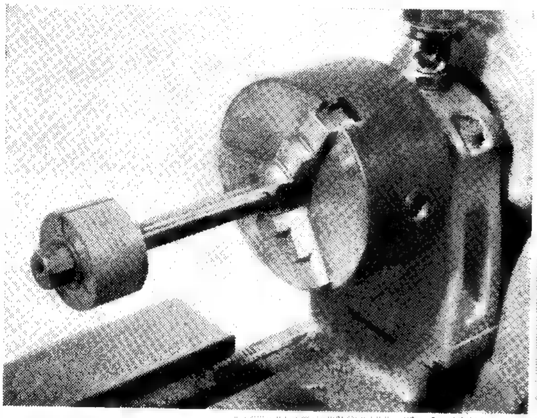
Special abrasive materials are available for lapping, but the quantities required are so small that it is hardly worth while to obtain them, as ordinary valve grinding paste works quite efficiently for rough lapping, and can be followed up by flour emery, aluminium oxide, tripoli, etc., the last-named being capable of producing a finish high enough for all practical purposes.

While it is generally recommended that a separate lap should be used for each grade of abrasive, I have found that if the lap is washed in paraffin and scrubbed with a file card after each stage, the few particles of coarse abrasive left do not visibly affect finish ; and, as a matter of fact, minute criss-cross scratches distributed well over the cylinder surface are an advantage rather than otherwise.

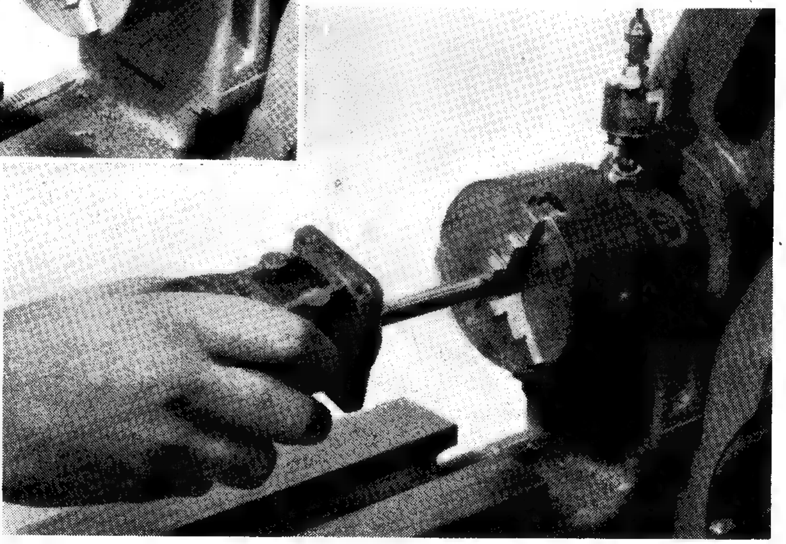
with finer abrasives, the adjustment of the lap should be on the tight side—eventually almost to the squeaking point—so that very small local discrepancies can readily be felt.

It cannot be too frequently or emphatically stated that the principal essential for successful lapping is patience, as this job cannot possibly be done in a hurry ; each grade of abrasive should be worked until the " feel " is even all over and the appearance of the surface, when cleaned off, is perfectly uniform. Polish, as such, is much less important than accuracy, and judgment by the mere appearance of the bore surface may, in some cases, be misleading.

If constructors have access to honing appliances, cylinder finishing is much less tedious, but few of us are in this fortunate position, and I am writing for the benefit of the average model engineer rather than for those with special facilities. There are some engineers who prefer to avoid any kind of abrasive methods in finishing cylinders, and I am entirely with them—if they can guarantee accuracy by plain machining methods. It is often asserted that the presence of visible tool marks in the bore is actually an advantage, as it speeds up the bedding-in of the rings and also forms a " key " for the oil film. This is true up to a point, but in a small bore cylinder, the process of bedding-in will usually increase piston clearance, and, incidentally, the piston ring gaps, to an undesirable extent. The advantage of a high finish is that it requires little or no bedding-in, always provided that it is accurate and not a mere polishing of an inaccurate surface.



Above — Adjustable lap, mounted on taper mandrel held in three-jaw chuck



Right — Cylinder applied by hand to revolving lap

The lap shown in the photograph is of soft and porous aluminium, and is fitted to a tapered and nutted mandrel, being split right through in one place and partly through in two others. It is run at medium speed, and the cylinder is applied by hand, as shown, being kept moving endwise throughout the entire operation, the amount of travel being just sufficient to reveal about half the length of the lap at each end. Abrasive paste is applied to the lap, which is kept adjusted to the size of the bore so that any difference in diameter can be detected by variation in friction. A little oil may also be applied, just sufficient to prevent the lap drying up. In the later stages of lapping,

Objections to abrasive finishing methods are usually based on the idea that it is difficult—some say impossible—to avoid particles of abrasive becoming imbedded in the surface, and retained to play havoc later on. I have never found any trouble from this cause, however, provided that scrupulous care is taken to clean the surface after

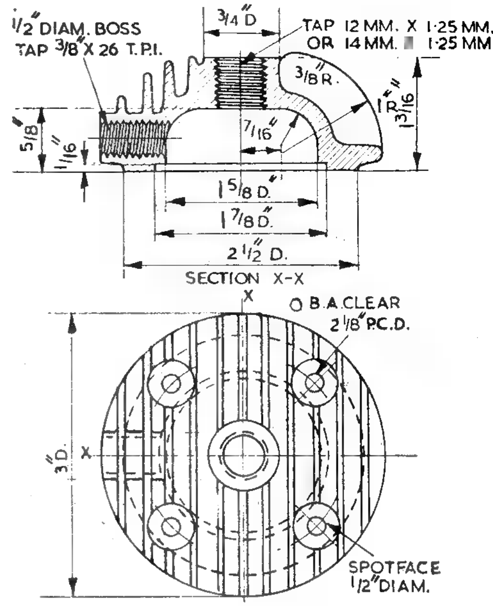
finishing, by soaking in paraffin for several hours, then syringing ports, passages and other interstices, scrubbing working surfaces with a stiff brush, and finally drying with soft, clean rags. In this matter, as in all others connected with engine construction, carefulness finds its own reward.

Transfer Port Cover

The detail drawing of this component was shown adjacent to the cylinder drawing on page 610 of the May 10th issue. It is a very simple item, requiring only a facing operation on the flat side, apart from drilling, and it may conveniently be held in the four-jaw chuck, taking care to set it to run as truly as possible on the face. After drilling the two holes, and spot facing them on the outside, it is a good idea to lap the joint face on a flat glass plate, to ensure a perfectly true surface, and thereby eliminate all possible risk of a leaky joint when the cover is clamped in position on the cylinder. This applies also to other joint surfaces where lapping is practicable.

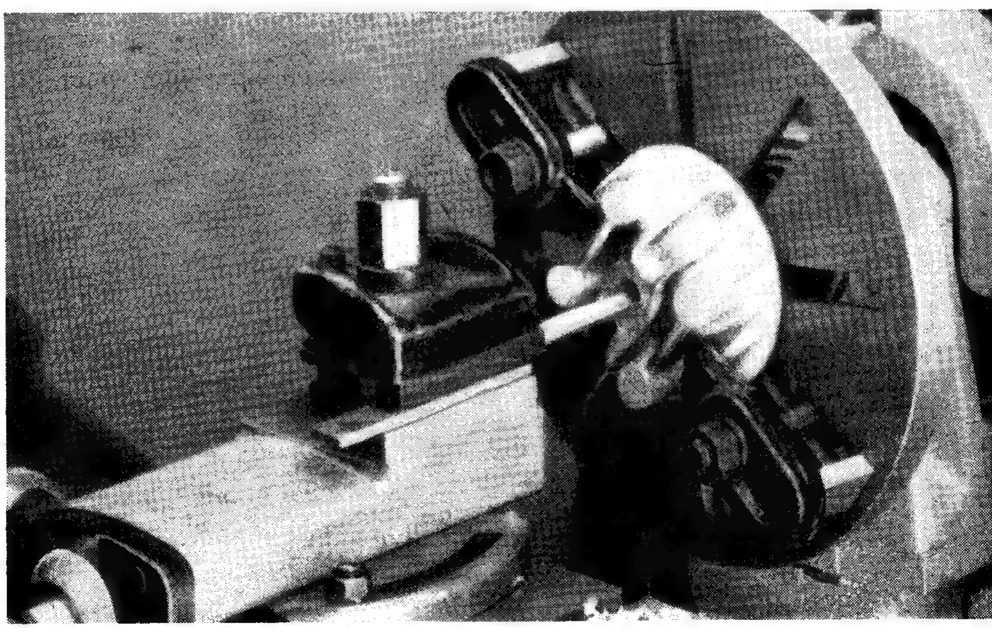
Cylinder-Head

For machining the inside of the combustion space, facing the underside, and recessing the register surface, the casting may be held in the four-jaw chuck, over the tips of the stud bosses, which project far enough beyond the fins to enable a firm grip to be obtained on them. It should be set to run as truly as possible, both concentrically and on the face, after which all the above operations may be carried out at one setting. The recess should fit the spigot on the cylinder barrel, though it is not necessary to produce a



(6) CYLINDER-HEAD 1 OFF
MATERIAL ALUMINIUM

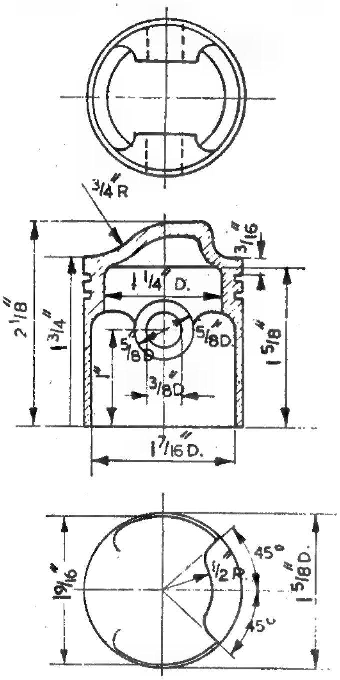
tight "snap" fit in this case, and the depth should be about 0.005 in. less than the spigot, so that when assembled, the narrow inner face of the recess makes contact with the face of the spigot. These surfaces can be lapped together to make a



Cylinder-head held on faceplate (after machining underside) for drilling and screwcutting sparking-plug hole

metal-to-metal joint and eliminate the need for packing.

If desired, the hole for the sparking-plug may be drilled and screwcut at this setting, though it may be found easier to do it from the outside, holding the head either on the faceplate, or over the chuck-jaws. It will be noted that the head may be adapted to take either 12 mm. or 14 mm. standard sparking-plugs, the latter being most readily available, though I consider they are definitely on the large side for ■ engine of this size, occupying more than their fair share of space in the head. In either case, however, the pitch of the thread is 1.25 mm.,



⑦ PISTON – 1 OFF
MATERIAL ALUMINIUM

which need not frighten anyone whose lathe is not equipped to cut metric pitches, as it is so close an approximation to 20 t.p.i. that scarcely any discrepancy is detectable in the length of a normal-reach plug. It is, of course, possible to obtain standard taps to cut these threads.

Alternative plug sizes are the 10 mm., as used on Packard and certain other full-size engines, and the $\frac{3}{8}$ in. $\times$ 24 t.p.i. miniature plugs, which give quite good running results, but are somewhat fragile mechanically for rough every-day usage. I do not advise attempting to use plugs of the original De Dion 18 mm. standard, which are out of all proportion to the size of the engine. Practically all two-stroke engines are rather finicky in their choice of plugs, and a great deal depends on getting just the right plug for the engine.

The outside of the plug boss should be carefully faced to provide a true seating, and the length of the hole should be adjusted to suit the reach of the plug. On no account should the hole be considerably deeper than the plug thread so that the spark gap is located in ■ pocket of inert gas, but on the other hand, it should not project so far into the combustion space that it encounters undue heat. Redundant threads on the inside of the head should be counterbored or chamfered, so that they do not form lodging places for the accumulation of carbon, or hot spots to start pre-ignition.

For drilling the stud holes, methods which have already been mentioned in connection with the main bearing housing are applicable with advantage. The outer face of each boss should be spot faced, and the height of the bosses should be uniform.

It may here be remarked that the castings for the cylinder head, as used on the original engines, do not correspond with the drawing in respect of the number of cooling fins, as the foundry was unable to make ■ sound job of the closely spaced fins specified. This has naturally resulted in some loss of cooling surface, but the engines have behaved satisfactorily in normal service. However, I would much prefer to see more efficient finning on the cylinder head, and steps have been taken to produce ■ die casting with ■ full complement of fins. If sufficient support is forthcoming from constructors, this improved head will be made available to them in due course.

When the engine is used for driving a cycle, it is advisable to equip it with ■ compression release valve, known generally, but not strictly correctly, as a "decompressor." Provision has therefore been made in the head for this fitting, by way of ■ horizontal boss drilled and tapped in the side. It is advisable to carry out this operation by clamping the head on an angle plate, by a single bolt through the plug hole, taking care to avoid damage to the face of the hole by fitting a fibre washer at this point.

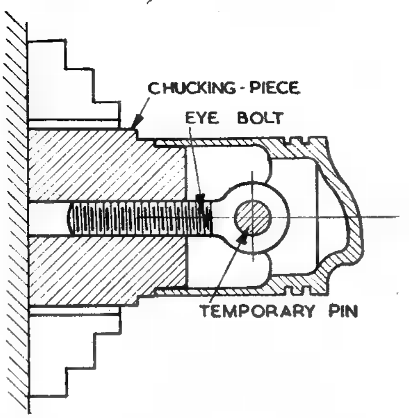
The head should be squared up by reference to the line of the fins, and the boss then set to run truly, when it can be faced, centre-drilled, drilled and tapped (or screwcut). This is much better than attempting to carry out the operation by "drill press" methods, and using a rotary cutter for facing.

Piston

The casting for this is made in ■ special alloy with a low coefficient of expansion, so that it will work with the minimum clearance. Many engine constructors like to see piston castings provided with chucking pieces, so that the entire working surface can be machined at one setting, but while this, as a general principle, is very sound, my experience is that it often leads to slipshod setting up, as it is so easy to grip the stalk in the chuck and worry about little else. My methods are, perhaps, a little outside standard practice, but they ensure accurate results if carefully carried out.

The casting is first held in the four-jaw chuck at the head end, leaving the major length projecting, up to well above the level of the gudgeon pin position. It is set to run as truly as possible on the *inside* surface, using ■ bent scriber to check up on the portion beyond the bosses, and not

worrying about the external truth at all. This will ensure that, when the piston is finished, it will be of uniform thickness all round. The end is then faced, to correct length, the inside of the skirt bored out as far as the bosses will allow, and the outside turned, as far as the chuck jaws will allow, to about 1/32 in. or so over finished size.



Method of mounting piston for external finishing

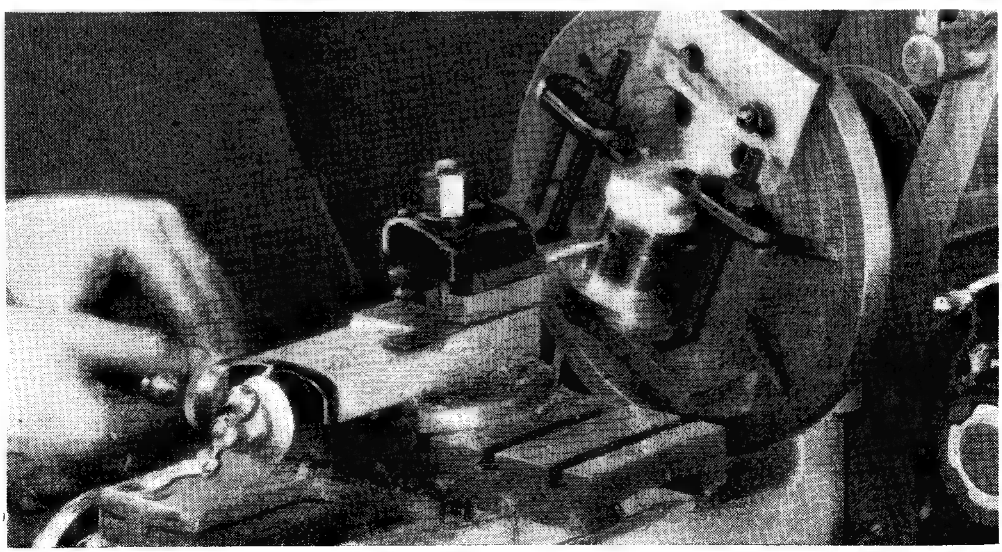
While it is still in the chuck, the centre line of the piston, in the plane of the gudgeon pin bosses, is marked out by means of a scribing block on the lathe bed or cross-slide, with the scriber set exactly to centre height. This line should be produced on both sides of the external surface, and then by means of a point tool in the toolpost, the position of the gudgeon pin centre, in relation to the end of the piston skirt, should be marked. This will locate the exact centre for the cross-hole on both sides of the piston.

For boring this hole, the piston is now mounted on an angle plate by two bolts and clamps or, alternatively, a single strap, bearing on the crown, but before placing it in position, a line should be scribed squarely across the face of the angle-plate, from front to back, and the centre lines on the piston are then placed so as to coincide with this line, and thereby ensure that the diametral centre of the piston is square-on to the faceplate; in other words, parallel to the lathe axis. The assembly is then set up by shifting it bodily on the faceplate, to locate the marked centre of the gudgeon pin exactly concentric, and after balancing the offset weight of the angle-plate, the hole through both bosses can be centred, drilled undersize, bored, and finally reamered.

This method of cross-boring definitely ensures geometrical accuracy, that is, squareness of the hole with the axis, which is much more important than location in other planes, though this also should be observed as carefully as possible. It is, of course, essential that the angle-plate should be dead square, and the faceplate run exactly true on the surface.

It is most important that the piston should be held for external finishing in such a way that no stresses liable to distort are produced. Ordinary methods of chucking leave much to be desired in this respect, and the usual procedure is to locate the piston from a spigot fitting neatly, but not too tightly, inside the skirt, and held against it by end pressure, using a central drawbolt with an eye engaging a dummy gudgeon pin passing through the cross-holes.

In this position, the external surface of the piston can be finished throughout, including the piston ring grooves, and the sides of the deflector, which are $\frac{1}{16}$ in. smaller in diameter than the piston body. This part should be machined until the base of the deflector, both on exhaust and transfer sides, just shows a "witness" mark to ensure a clean cut-off point. The ring grooves should preferably be machined with a tool



Piston mounted on angle-plate attached to faceplate, for boring gudgeon-pin hole

narrower than their full width, and opened out by taking side cuts rather than trying to finish them in a single plunge cut, as this may result in a poor finish and thereby impair the compression seal. The bottom clearance should be not less than about 0.005 in. (i.e. the groove should be that much deeper than the radial thickness of the ring), and the side clearance should be about 0.002 in., or such that a slight side shake is perceptible when the ring is entered in the groove "upside down."

Piston clearance is most important in two-stroke engines, as it is essential for it to be sufficient to avoid tightening up by expansion when the engine is hot, yet not so large as to impair the port-sealing efficiency. In this particular engine, with the particular light alloy used for the piston, it has been found that a clearance of not less than 0.0035 in. at the skirt is necessary, increasing above the gudgeon pin to 0.006 in. at the top end. The best way to measure these clearances, in the absence of elaborate measuring instruments, is to insert the piston in the cylinder bore and use feeler gauges.

For producing a good finish on the piston, a very keen narrow-edged tool should be used, and it may be found desirable to use a lubricant such as paraffin or turpentine. The use of emery cloth on the piston is not advised, and through filing is permissible, it will be found difficult to avoid "pinning" of the file with consequent scratching of the surface. The special piston alloy does not machine very easily, and in production practice it is usual to employ diamond turning tools for finishing pistons; but with care, it is possible to obtain quite good results with ordinary cutting tools.

(To be continued)

FUELS FOR SMALL ENGINES

The Shell laboratories, in co-operation with the engineers of International Model Aircraft Ltd., have recently developed two fuels especially for model engineers—Shell Powa-Mix for model diesel engines, and Shell Red Glow for hot coil ignition engines and for spark ignition engines which have too high a compression ratio for gasoline mixtures.

"Powa-Mix" (Compression Ignition)

The intention behind the introduction of this ready-to-use fuel (not requiring the addition of ether) was to provide one at a price well within the reach of the most impecunious enthusiast in the model engineering field. The use of costly chemical additives has been kept to the minimum consumate with performance, and by keeping the formula as simple and straightforward as possible, the makers have been able to ensure a continuity of supplies to the same specification.

"Red Glow" (Hot Coil or Spark Ignited)

This is basically an alcohol castor oil mixture. By ensuring that both these ingredients are of the highest possible (A.M. Specification) standard, Shell Mex & B.P. Ltd. have obviated the necessity of resorting to the use of dopes or additives to secure adequate mixing. They state that although they are fully aware that nitro-paraffins, nitro-methane or propane do give added performance, these are not emboded in this particular fuel, due to their very high cost with consequent additional premiums on the retail price. The addition of less than 12 per cent. of these nitro-paraffins, furthermore, does not give a performance increase to justify the additional cost.

An interesting point which has been quite definitely established in the Shell laboratories is that catalytic action does take place when using platinum wire (glow-plug), and alcohol fuel, and the addition of some of the dopes on the market tends to impair rather than improve this particular characteristic.

We have received samples of both these fuels, and they have been thoroughly tested under our supervision with excellent results. Both are marketed in half-pint pressure feed packs (see illustration) which obviate the necessity for painful decanting before refuelling can be affected.

Distributors: International Model Aircraft Ltd., Merton, London, S.W.19.

A Collet Chuck

by A. D. Stubbs

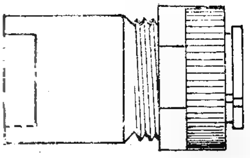


FIG. 1.

WHEN I get a "one off" job, I just get on with the work, and in due course it rolls off the machine. When I get two alike, I finger the turret lovingly and probably, with a sigh of regret, again get on with the job. But when I wanted six little ornamental feet, from brass bar, all alike, all six of them, mass production went paramount.

The result was that I spent about a month making repetition tools, and about two hours doing the job, so here is part of the month's work.

My four-jaw independent chuck is a good and faithful servant and friend, but not ideal for holding bar coming through the mandrel. Three-jaw self-centring chucks I dislike on principle, as they never seem to come back to the same place twice. Collet chucks have the disadvantage that a full range of collets is necessary, each individual collet having but a limited scope; but they are so easy and quick to set up, and so accurate, that my vote goes to them every time. And no-one is going to nationalise mine!

Fig. 1 shows the finished job, with one set of collets inserted. Mine is made for a Myford $3\frac{1}{8}$ in. lathe, with $\frac{7}{8}$ in. by 9 t.p.i. mandrel, hence the dimensions given in Fig. 2 for the chuck body. For a $1\frac{1}{8}$ in. mandrel, dimension *A* would be 2 in. and *B* 1 37/64 in. The *M* dimensions must, of course, be taken from each individual lathe mandrel; and here I should stress that when a collet is right home, its internal end must not touch the mandrel nose. So ensure that the length of internal screwing is more than sufficient;

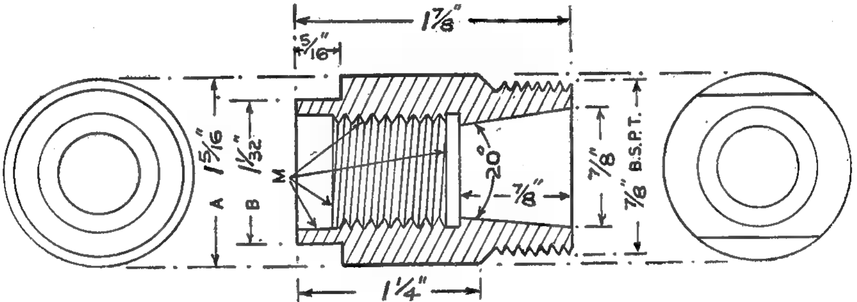


FIG. 2.

Material

Steel will serve quite well for a chuck body, but cast-iron is much better. A pulley casting, the arms of which had been broken on rail, provided me with a solid cast-iron boss, ideal for the job. All the machining is tool-room finish and, for beginners, take care that the body is not only a good fit on the mandrel thread, but that it butts right up to the mandrel flange. The recess for the mandrel shoulder must, too, be a nice fit. The recess in the chuck at the internal end of the thread for the mandrel was bored out to $\frac{7}{8}$ in., giving a good clear run for the later operation of the threading tool.

For the spanner flats an end-mill is the tool, the body being mounted on the milling slide. By the way, the 20 deg. internal angle was not cut until all the collets were ready for the same operation, this ensuring that by using precisely the same top-slide setting, every component was machined to the same angle. An initial central hole, $\frac{3}{4}$ in. less 1/64 in. was one of the first operations.

The chuck cap (Fig. 3) came out of $1\frac{1}{2}$ in. bright mild-steel, and a skimming cut was taken over the full diameter, so mine is slightly undersize on this dimension. Normally the collets can be freed by hand, hence the knurling, but when I am screwing stock in the collet chuck I use a spanner *lightly*, although, to be quite frank, I have never known the work slip with hand tightening.

I could not resist using my turret and back toolpost for the collets (Fig. 4). All six came out of one piece of $1\frac{1}{8}$ in. black mild-steel, centred and first turned throughout its length to $1\frac{1}{16}$ in. diameter.

With the travelling steady, which rides on the headstock side of my saddle, each collet was turned down to $\frac{7}{8}$ in. diameter, excepting the 5/32 in. width locking-ring. Each 5/64 in. recess for the horseshoe spanner was cut with a parting tool in the rear toolpost, and each collett

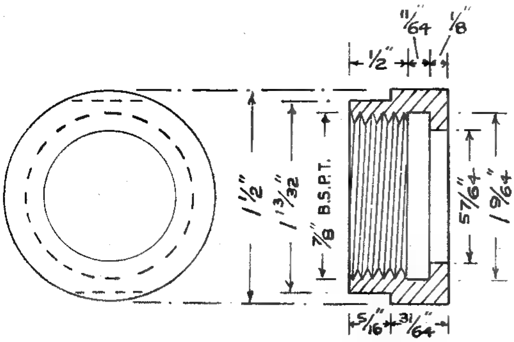


FIG. 3.

was " semi-parted " to ½ in. diameter at what was eventually the small end of the taper.

Fig. 2 external dimensions hold good for the four smaller collets, and I originally intended to make four only, restricting the capacity of the tool to ⅜ in.–9/16 in. However, I had the 1⅛ in. steel, so I made the six. For the fifth, eventually bored ⅝ in., [redacted] taper length of ¾ in. instead of ⅞ in. is all that can be cut, and for the sixth and largest, bored 11/16 in. only a 9/16 in. length is necessary. In both these of collets the horse-shoe spanner recess had to be omitted, as I had insufficient metal. In scaling up the chuck for [redacted] larger mandrel, these little troubles will not arise.

The top-slide was now set over ten deg., and all six cones cut, using the travelling steady on the 1 1/16 in. diameter of the next in line, then the six collets were parted from the stock. At this stage, I bored the taper in the body which was, of course, mounted on the lathe mandrel direct, so ensuring that no matter where the outside came, the cone was dead true to the lathe.

used with [redacted] light cut and slow feed, to ensure the greatest degree of accuracy.

For holes from ⅜ in. upwards, my boring bar [redacted] into play. For smaller holes, I use the shank of a broken ⅛ in. drill, held in the boring bar at three degress off the lathe centre-line (plan view). The business end of this is ground as [redacted] square-nosed boring tool, the three degrees clearance enabling me to bore out from [redacted] 9/64 in. hole if necessary.

Cutting the Slots

Only the 120 deg. slots in the collets now remained to be cut. A 5/64 in. slitting saw provided just sufficient clearance to give the set of collets [redacted] slight overlap in their capacities. Each in turn was mounted between angles on the milling slide, but before setting up I centre-punched each

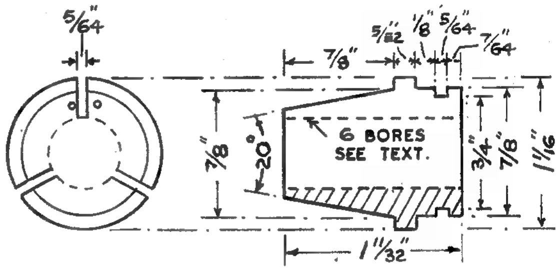


FIG. 4.

collet twice, as shown in Fig. 4, end view. These centre-pops are always set together when the slips are slipped into the body, as a final guarantee of accuracy.

Finally, ensure that no burrs are left anywhere, and the collet chuck is ready for use. Fig. 6 shows [redacted] simple extracting spanner, which I made up from 16-gauge steel. This slips in the recess of either of the collets, then unscrewing the cap

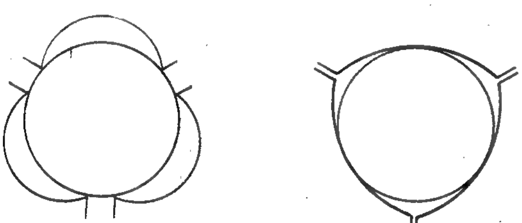


FIG. 5.

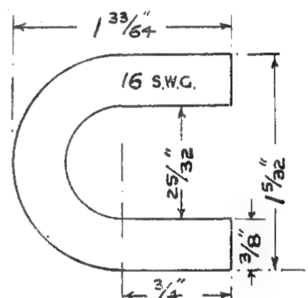


FIG. 6.

My body and cap were now utilised to hold each collet in turn. The finished bore diameters are 27/64, 29/64, ½, 9/16, ⅝ and 11/16 in.

Each [redacted] drilled from the tailstock under-size, starting with [redacted] ⅛ in.pilot hole, and then bored to the final dimension. For the ½, 9/16 and ⅝ in. sizes I finished with [redacted] reamer, but did not possess the other reamer sizes, so the boring tool was

forces apart the cones without having recourse to driving.

Another word for beginners. Don't attempt to insert larger stock in [redacted] collet than the diameter to which that particular collet was bored. Fig. 5 shows you what happens. You *can* get in a larger piece of material than it was designed to take, as in the " wrong " sketch. This will mark

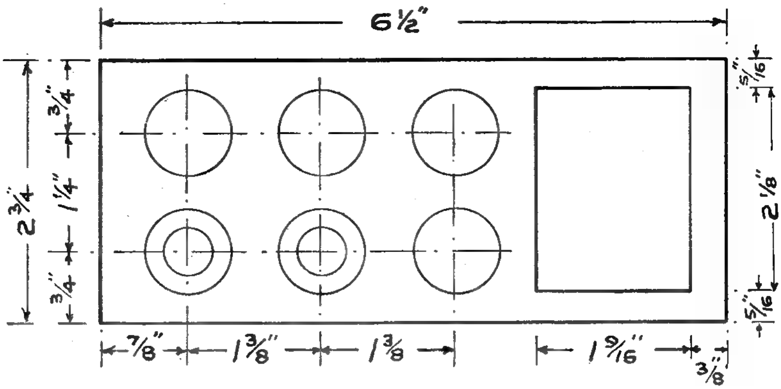


FIG. 7.

your stock in six places, which may or may not matter, but it will almost certainly distort the collets, especially in the larger sizes, and henceforth they will be useless. The "right" sketch shows material smaller than the bored rating, held truly central, and unmarked. The second point is, don't divide the collets with the slitting saw before you bore them. If you did, you would get the effect of the "wrong" sketch. These two sketches are exaggerated, to describe my points more clearly.

And when they are finished, don't toss them all in a box. Fig. 7 indicates a piece of three-ply which I inserted about half depth, on ledges, in a metal, 100 cigarette, box. The rectangular hole accommodates the assembled chuck body and cap, and each set of collets has a private compartment. The two largest are centralised by an inch length of $\frac{1}{2}$ in. round wood rod, woodscrewed in position from beneath the box. This was an afterthought, as the $\frac{11}{16}$ in. collet slips were liable to fall out of position.

This is one of the most useful tools I have, and one day I shall probably increase the range at the lower end. Which reminds me, that for the two smaller ones I counter-drilled the bores for $\frac{3}{8}$ in. depth with a $\frac{1}{2}$ in. drill. This minimised the depth of boring.

Prizes for Inventions

THE Council of the Royal Society of Arts will be offering certain awards in 1951, under the Thomas Gray Memorial Trust, the objects of which are: "The advancement of the Science of Navigation and the Scientific and Educational interests of the British Mercantile Marine."

A prize of £50 is offered to any person of British Nationality who may bring to the Council's notice an invention, publication, diagram, etc., which in the opinion of the judges is considered to be an advancement in the Science or Practice of Navigation, proposed or invented by himself in the period January 1st, 1946 to December 31st, 1951. Full particulars should be furnished with each entry and also a brief summary covering the essential points of the invention. Where practicable a model or some other appropriate exhibit should be supplied with the entry. Entries which have already been considered by the judges are not eligible for further consideration unless they have since been materially modified. Competitors must forward their proofs of claim between October 1st and December 31st, 1951, to the Secretary of the Royal Society of Arts, at the address given. The Council do not claim any rights in respect of an invention submitted to them, to which a prize is awarded.

In recognition of the remarkable skill which is so constantly displayed at sea, the Council offer an award of £50 to a member of the British Merchant Navy for a deed brought to their notice which, in the opinion of the judges to be appointed by the Council, is of outstanding professional merit.

The period to be covered by the offer will be the year ending September 30th, 1951, and the judges will proceed to consider their decision on or after January 1st, 1952. Deeds of a character worthy to be considered for this offer may be brought to the notice of the Council by any person not later than December 31st, 1951. They will not, however, be considered by the judges unless they have been endorsed by a recognised authority or responsible person able to testify to the deed to be adjudged. The Council reserve the right to withhold, reduce or divide either of the above awards at their discretion.

Any further information regarding this scheme can be obtained from the Secretary, Royal Society of Arts, John Adam Street, Adelphi, London, W.C.2.

Novices' Corner

Making a Small Parting Tool

SOME workers have difficulty in grinding ■ parting tool to shape so that it will cut freely and, at the same time, will have sufficient strength for ordinary cutting-off operations.

Lengths of high-speed steel, already ground to shape, can be bought from the tool merchant, but this material in the smallest size usually has ■ thickness of $\frac{1}{16}$ in. However, for parting-off bars of small diameter, as well as thin-walled tubing, a thinner tool will not only cut more freely, but will also impose less thrust on the work and may thus overcome the tendency to chatter, so common in lightly-built lathes. The cutter mounted in the toolholder, illustrated in Fig. 1, has a thickness of only 26 thousandths of an inch, and will be found to cut well, even when used in the ordinary toolpost at the front of the lathe.

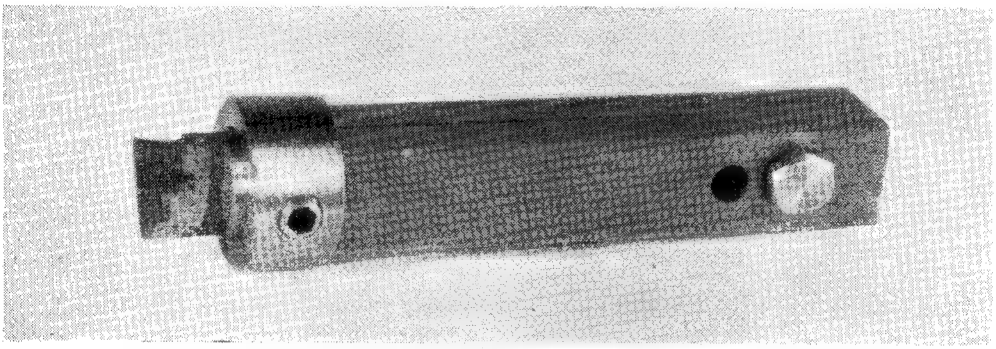


Fig. 1. The finished parting tool

This cutter is made from ■ broken or discarded hacksaw blade, and is easily ground to shape and resharpened. Although the tool is not intended for heavy work, it was found that ■ length of $\frac{5}{8}$ in. dia. mild-steel round bar could be parted-off without difficulty; to give greater rigidity, however, the cutter is normally set to project only some $\frac{5}{16}$ in. from the holder.

The Cutter

This is best made from ■ high-speed steel blade, as this material is stronger than ordinary tool steel and keeps ■ sharp edge longer. The difficulty here, is that these blades cannot be drilled, or have holes punched in them, once they have been finished for service by heat treatment. This objection is, however, overcome by making use of the standard fixing holes formed in the blade, and in this way one blade will make two cutters.

If ■■ attempt is made to break off the cutter to the required length by bending the blade in the vice, the result is rather uncertain, as the fracture may be very irregular and not exactly where intended. The blade may, however, be broken off more accurately if it is first heavily nicked on the edge of the grinding wheel, but a much better way is to cut the blade across with ■ cut-off wheel. A cut-off wheel suitable for this purpose would have ■ thickness of 3/64 in. or $\frac{1}{16}$ in. and ■ diameter of some 6 in. These wheels have the abrasive cutting grains embedded in a matrix of flexible material, and are designed to be driven at approximately the same speed ■■ an ordinary grinding wheel.

After the blade has been marked-out to length, and with the front edge at an angle of from 8 deg. to 10 deg., the material is cut along the scribed line by bringing the blade carefully against the cut-off wheel, but on no account should damage to the wheel be risked by crowding the work hard against the edge of the wheel or by thrusting the material sideways. Next, the $\frac{1}{2}$-in. blade is reduced to a width of $\frac{3}{8}$ in. by grinding on the periphery of the ordinary wheel used for tool sharpening. By working to scribed dimension lines, an equal amount is ground from either edge in order to keep the fixing hole central in the blade; in addition, any set remaining at the roots of the teeth should be removed by careful grinding. The tool illustrated was made for use in a Drummond-Myford tool turret designed to hold $\frac{3}{8}$-in. square tools, but if the toolholder is made to take ■ cutter of $\frac{1}{2}$ in. width, the blade need then be ground only on the side faces in order to remove the set given to the saw teeth.

The cutting edge of the blade is finished with the grinding table set exactly at right-angles to the side face of the wheel, and in this way the front edge is ground to give the tool a front clearance of from ■ deg. to 10 deg. In addition, for machining steel, ■ top rake of from 5 deg. to

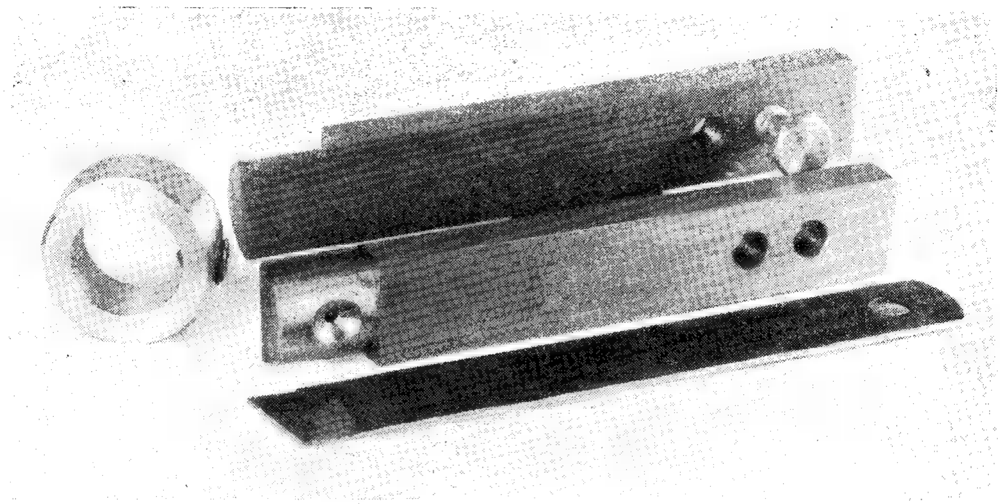


Fig. 2. The cutter blade and the parts of the holder

10 deg. is ground on the upper edge of the cutter, but excessive top rake will weaken the tool and may cause digging-in when parting-off. For cutting brass or bronze, however, little or no top rake should be used.

The Toolholder

The tool shank is composed of two lengths of mild-steel, $\frac{3}{16}$ in. in thickness and [illegible] in. in width; at the outset, however, material of $\frac{7}{16}$ in. or $\frac{1}{2}$ in. width is used and this is reduced to the finished size at a later stage. One of these pieces is first marked-out and then drilled with a No. 27 drill to form clearance holes for the 4-B.A. clamp-screw. As will be seen in the drawing, two positions are provided for the clamp-screw to enable the blade to be set forward, either to counteract wear or to give a greater depth of cut.

The two lengths of material are next gripped together by means of two toolmaker's clamps, so that the parts exactly coincide when tested with a small try-square. The first member is now used as a jig for drilling the second, and the clearing-size drill is put in for a short distance to mark the drilling centre for the No. 32 tapping-size drill that follows. After the work has been tapped and the two parts fixed together with the clamping-screw, the holder is gripped in the vice to enable the upper and lower surfaces to be filed truly square with the side faces, and, at the same time, the shank is reduced to an overall height of approximately $\frac{3}{8}$ in. If, instead of filing, a small shaping machine is used, this work will be much more easily carried out, and there will be no difficulty in machining the shank parallel and with its surfaces square with one another.

The next operation is to form the cylindrical end on the shank by a machining operation in the lathe. For this purpose, a packing strip, of the same thickness as the cutter, is placed between the two halves of the holder before they are clamped together.

The work is next gripped in the four-jaw chuck, with a packing-piece placed against the upper and lower surfaces, as represented in Fig. 3. By this means, the two parts of the holder will be correctly aligned when the chuck jaws are tightened. The work is centred in the chuck by bringing the contact point of the dial test indicator, in turn, against each of the four corners of the shank while the lathe mandrel is slowly turned by hand.

A knife tool is then used to turn the end portion of the shank to a diameter of $\frac{3}{8}$ in. for a distance of 11/32 in.

It will be clear that when, later, the two parts of the holder are clamped together by the screw at one end and the clamp collar at the other, the

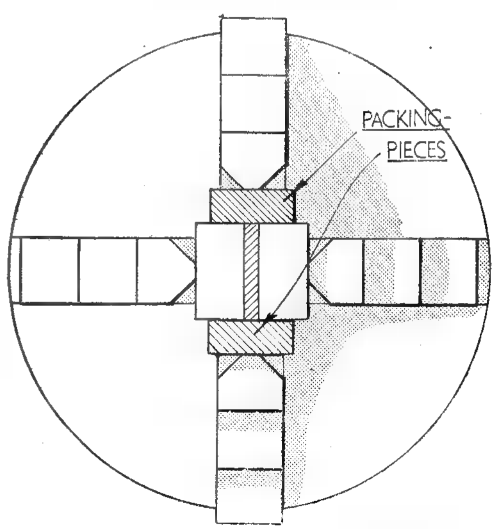


Fig. 3. Mounting the work in the four-jaw chuck for machining the end of the shank

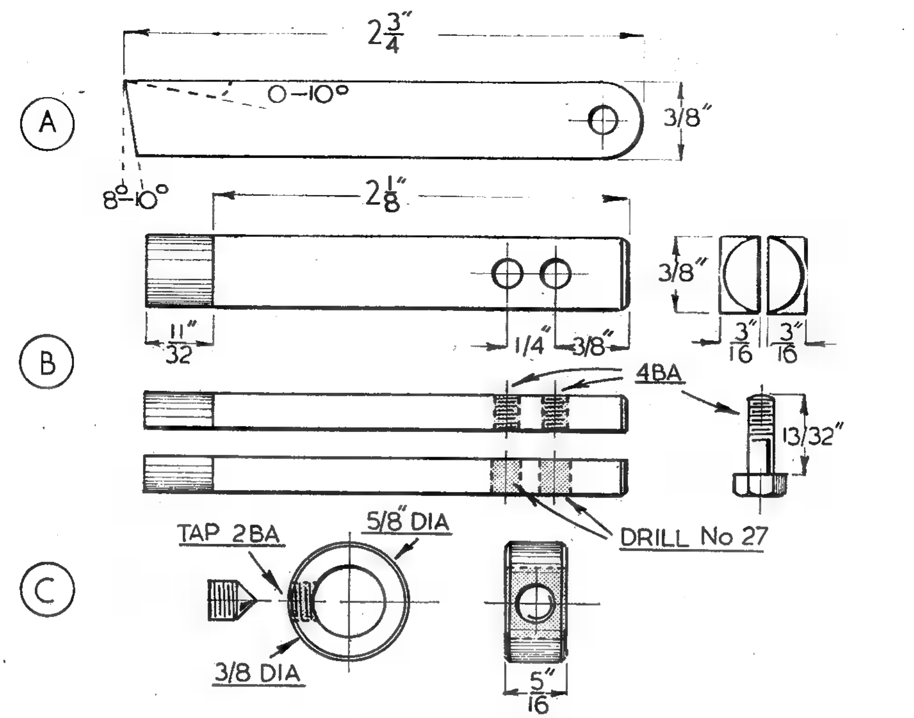


Fig. 4. "A"—the blade; "B"—the holder and clamp-screw; "C"—the clamp collar

upper and lower surfaces of the shank will be truly aligned and the cutter will stand vertically.

The clamp collar can now be turned from a length of $\frac{5}{8}$ in. dia. round mild-steel. This is first drilled axially and then finished with a small boring tool to fit on to the cylindrical end of the holder with the packing strip still in place.

After the collar has been parted-off to length, it is marked-out and then gripped in a machine vice for drilling and tapping the radial hole to receive the 2-B.A. grub-screw used for clamping the blade. A pointed, Allen grub-screw will serve best for this purpose, and the dimple formed when the screw is tightened will automatically mark a drilling centre on the shank; this centre is enlarged with a twist drill to give a bearing for the screw point and so keep the collar in place.

As the side faces of the cutter are parallel, the tool has no side clearance and so will fit closely in the groove cut in the work. Although the friction set up in this way is apt to limit somewhat the depth of cut that can readily be taken, the tool will, nevertheless, cut freely when parting-off small work.

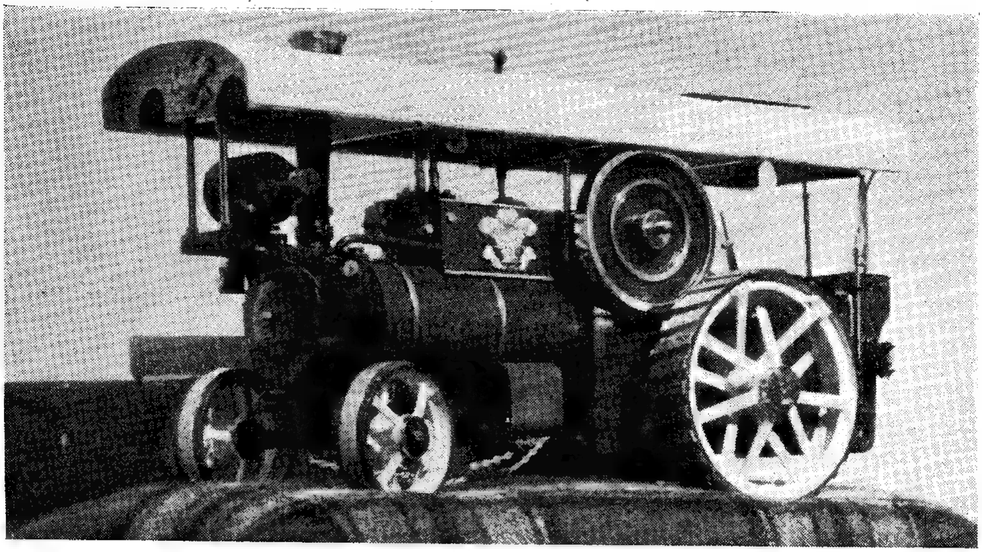
To maintain free-cutting as the tool goes deeper into the work, side clearance may be provided by grinding the side faces at the end of the blade. To do this, the angular grinding-rest is set so that a clearance angle of not more than 1 deg. is ground on either face. If larger clearance angles are formed, the tool may be weakened; for this reason, also, care should be taken during grinding to keep the edges of the blade parallel when viewed from above.

The Tool in Use

After the blade has been firmly clamped in the holder, the tool is mounted in the lathe turret or toolpost at exactly centre height. The blade must be set truly square with the lathe axis by aligning the side face of the tool against the faced end of the work; any slight error in this respect will, however, be corrected if, after the tool has entered for a short distance, the toolpost clamp is slackened and the cutter allowed to align itself. As the tool lacks clearance behind the cutting edge, careful feeding is necessary and plenty of cutting oil should be used. A slender tool of this kind cannot be expected to take heavy cuts, nevertheless, when machining mild-steel, a continuous coiled chip is formed.

One difficulty with this, as well as with some other types of parting tools, is that a tightly-coiled chip may jam in the groove cut in the work and so cause the tool to dig-in.

The form of the chip will depend, in part, on the material being machined; but if the lead-off, that is to say the upper surface of the tool behind the cutting edge, is made flat and not curved, there will be less tendency for the chip to form a tight coil.

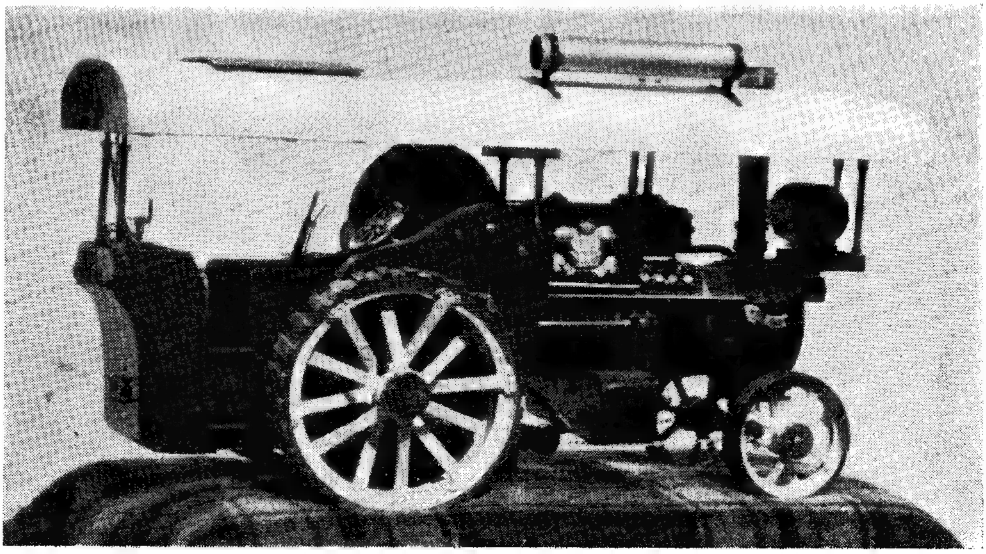


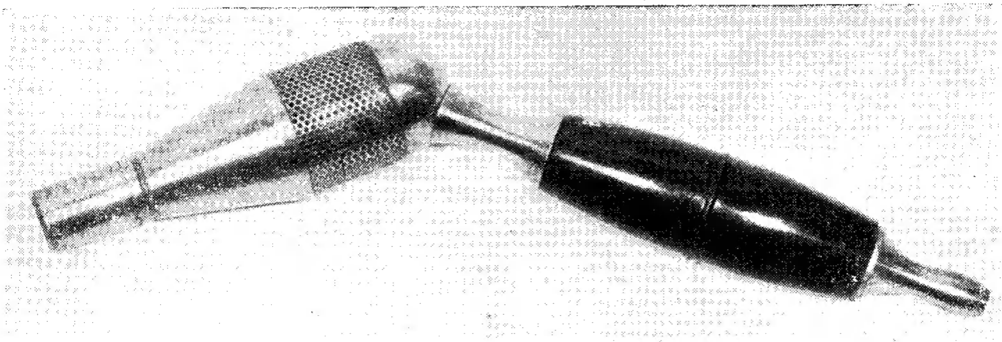
A FREE-LANCE SHOWMAN'S ENGINE

by H. C. Manley

THE model depicted in the accompanying photographs is a free-lance $\frac{3}{4}$-in. scale showman's engine, built from a well-known set of commercial castings. Although it is complete with full motion, gearing, etc., it is not a steam model, and is intended only for ornamental purposes. The motion and road wheels are turned by means of an electric motor and plain drive to the crank shaft. This model occupied two years of spare time, but the lessons learned in painting a previous model locomotive were of great value in this case.

The faults and bad workmanship in the model are many, various and very obvious ; but in spite of these, I succeeded in building a model of a prototype that has always been of great interest to me, and amply repays me for the time and trouble expended.





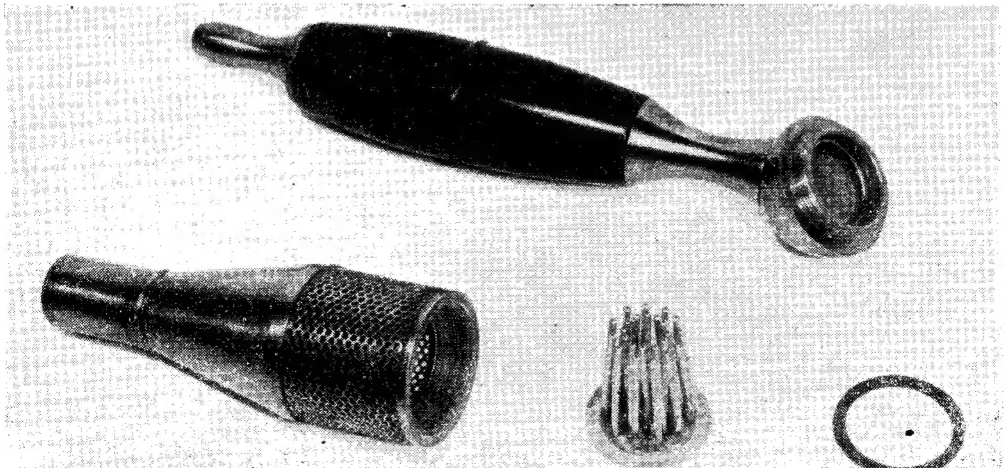
A SELF-BLOWING GAS TORCH

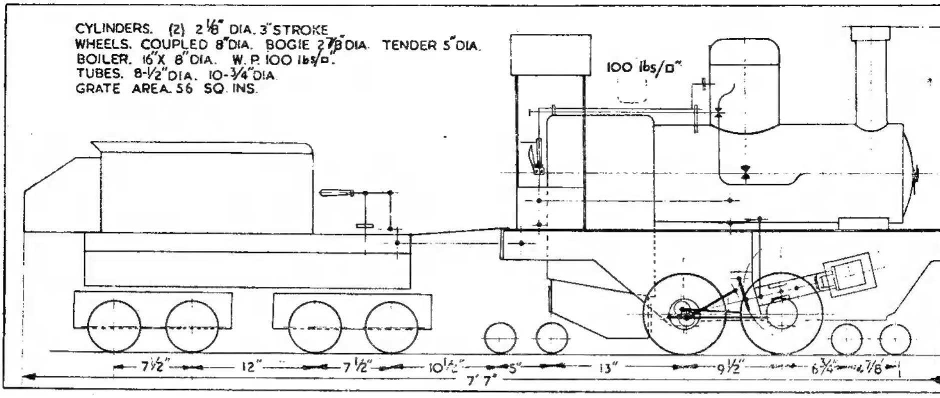
FOR simplicity of construction and use, the type of gas torch which works on the Bunsen principle still holds its own. Some manufacturers have given the self-blowing type of torch more attention in recent years, and the gap that exists between the humble Bunsen burner and the air-blown gas blowpipe is slowly being closed. An addition to this range has recently appeared on the market, and we have had the opportunity of testing one of the torches. It is known as the "Bullfinch" gas torch, and operates from the domestic gas supply. Of pleasing shape and well finished, it is comfortable to handle, weighing 1 lb. 4 oz.

A novel point in its design is the arrangement and number of gas jets. The jet tubes are arranged in two concentric circles, there being 12 jets in each circle making a "battery" of 24. These tubes project from a disc to which they are soldered (resembling a locomotive tube-plate) and receive the gas supply *via* the hollow handle. Immediately before entering the jet tubes, the gas passes through a gauze filter incorporated in the handle. Air enters a finely perforated sleeve surrounding the jets and is well mixed with the issuing gas, which has been broken up in 24 small sprays. The air inlet is not adjustable and the jets are not removable except as a battery.

In use, the burner gave a good hot flame, though the blue cone tip was somewhat ragged. A cock was used in the supply pipe and only a small measure of flame control was obtained before the torch "lit back" at the jets. Just before this point of control was reached, it was observed that the blue cone tended to split into two "tips." A "softer" flame can be obtained, when necessary, by encircling the air inlet sleeve with the fingers. The ingoing air kept the shroud of the mixing chamber quite cool during use, and this explains the suitability of soft solder for securing the jet tubes.

The makers claim a flame temperature of over 1,450 deg. C. (2,600 deg. F.) for this torch. It is manufactured by Messrs. Rainsford & Lynes Ltd., Emily Street, Birmingham 12, and may be obtained from tool dealers, including A. J. Reeves & Co., 416, Moseley Road, Birmingham, 12.



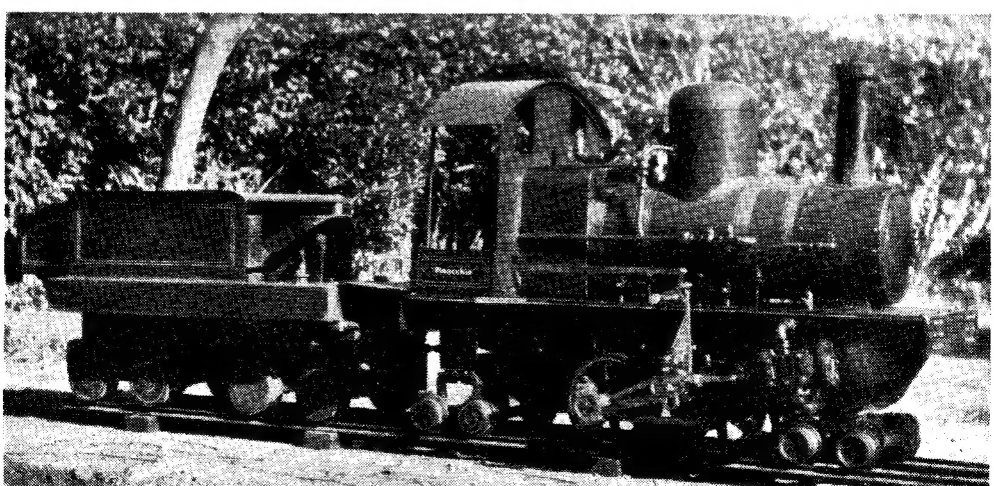


Small Locomotive Repairs in the Argentine

by P. G. Curtis, A.M.I.L.E.

IT was the writer's privilege to repair the locomotive shown in the photograph, and some details are given in the hope that they may be of interest to readers of THE MODEL ENGINEER. While the origin of the engine is unknown to the present owner, it may be that someone seeing this article might be able to throw some light on the matter. The engine is the property of Mr. R. M. Fraser, managing director of Alpargatas, Argentina, who came upon it some ten years ago in a local scrap yard, where it was lying in a dismantled state together with three twelve-seater passenger vehicles. The pieces were assembled, and after much improvisation, the missing parts were made and the engine completed. It then ran for some time in the owner's private residence giving a great deal of enjoyment to all who had the opportunity of seeing it under steam.

The scale to which the locomotive is made is approximately 1½ in. to the foot, although the gauge is 12¼ in., which makes for safer passenger hauling. This fact rather tends to indicate that the engine was made for passenger service in a public park, and may have been operated in this capacity; indeed, it has been suggested that this is one of the two engines which used to run in the Buenos Aires Zoological Gardens. The general proportions of the running gear indicate that it was intended for heavy work, although in certain respects some parts of the valve-gear were rather weak and liable to give trouble. The boiler was of a very robust construction, being strongly riveted and welded at the seams. The firebox was well proportioned and, with a medium fire, steamed well. Feed was by a large injector on the left-hand side and by a hand pump on the tender.



On test after repairs, the engine had no difficulty in moving a car weighing about 2,000 lb., but, owing to the limitation of space and available track, no real test has been made of its full hauling capacity, although it is credited with having pulled 40 adults with ease.

The engine is sprung on the coupled axles and these have been arranged to take most of the weight.

During repairs, several modifications were made to the valves and spindles, while the reversing gear was also altered and made more robust. The lubricator was modified and the oil delivery was made directly to the steam pipes. Anti-vacuum valves were made and fitted to the steam-chests, at the point where the oil pipes had previously been connected. The regulator, which consisted of an adapted steam cock, was substituted by a rotating disc-valve set in an appropriately drilled block on the steam pipe. No brakes were provided, which makes stopping quite an art, and judicious use of the reversing lever has to be made sometimes in order to prevent an untimely crash. The motion plates were strengthened, as they were found to be badly bent, with disastrous effects on the valve setting. New bushes were made and fitted where required, while the link trunnions were turned, as they were found to be out of alignment. A new return crank, complete with two new eccentrics, was made for the right-hand side. Considerable care was taken in setting the valves and fairly even events were finally obtained, although the somewhat unevenly cut ports in the steam chests made this job particularly difficult.

It will be seen that the valve-gear is Gooch's motion, and it is fascinating to watch in movement. With 100 lb. pressure the engine is very lively and, with sufficient track, will give many an enjoyable moment to those who are able to drive it, as well as to those who ride in comfort in the spacious carriages behind the tender; and provided, of course, that no objection is made to a few drops of oil and large quantities of soot when running into the wind.

PRACTICAL LETTERS

Another Nod

DEAR SIR,—Your "Smoke Ring," "Even Homer Will Nod Sometimes," April 26th issue, recalls something which happened to me some months ago. I had occasion to make some alterations to the driving arrangements of my lathe, and to the mounting of the motor. When I had finished, the lathe simply would not cut on any terms. I wasted a lot of time doing all the usual things: feeling for slackness in this, that, and the other, trying to take up play which really wasn't there at all, and squinting critically at the cutting edges of various tools. Finally, I gave it up in considerable disgust and did not go near the lathe again for several days. A further session produced no better results than the first and I began to get really annoyed. At the third attempt, after a further interval for recovery, I spotted it. Of course, I had turned the motor round while building a new mounting for it, and it was simply driving the lathe backwards. As soon as I crossed the belt all was well.

Yours faithfully,

London, W.1. JOHN H. AHERN.

"Britannia"

DEAR SIR,—Your two short notes on the above are very welcome, as there has been disappointingly little comment so far. My own reaction has been mainly disappointment, not with the actual design itself, which is excellent and strikes a happy mean, new ideas and accepted practice, but with the general conception of the whole locomotive; it is far too much of the big stick, there is no finesse about it.

It is officially stated that it is to do the same work as the G.W.R. "Castles," the rebuilt "Royal Scots," the L.N.E.R. "V2's" and the S.R. "West Countries," and with a *better* route availability. It is undoubtedly quite capable of doing the work, but it is heavier, longer and of greater wheelbase than any of them and its axle loading is considerably greater than that of the "Castle" or "West Country." In fact, one would have thought that a two-cylinder locomotive with $20\frac{1}{4}$-ton axle loads and only 6 ft. 2 in. drivers would have a pretty severe route restriction if run at express speeds. Has the permanent way department suddenly discovered that the track is not so tender as they thought? However that may be, it still does not seem to be true that the new engine has a greater route availability than those machines whose work it is designed to do.

My chief criticism is really that the design is a bit overlarge for the intended work. After all, it is a little short of the size of our biggest machines, and, secondly, that it should have been a multi-cylinder job; if two cylinders were considered essential for cheapness and ease of servicing, then the axle load should have been kept down to 19 tons.

To one who knows something about locomotives, study of the drawings shows that many of the best features from the various regions have been incorporated, but there are one or two items that might be queried; for instance, a proprietary multi-poppet valve regulator is fitted; no doubt this works very well, but is it superior to the very cheap, simple and perfectly working "Swindon" slide-valve regulator? This could easily have been arranged with outside rodding if desired. The bronze spring-loaded slipper to the piston, quite a new feature of which no details are given, but why bronze? The piston valves presumably have narrow rings; can anyone tell us if the lap and lead are measured from the ring or from the piston edge?

Yours faithfully,

Bexhill-on-Sea. C. M. KEILLER.

Motorising the Mower

DEAR SIR,—Just one further note on the above subject evoked by your correspondent, Mr. H. Glyn Jones, who very rightly and clearly draws attention to a potential danger which might easily lead to a tragic death, as has happened all too often in the past.

My point is that it is now bad practice to have the neutral fused, and if normal house supply, taken from phase and neutral of a three-phase, four-wire, a.c. main is so equipped, it is of an old-fashioned, dangerous and out-moded type not in accordance with regulations. My advice to any reader who, on examination, finds he has a fused neutral is to have the installation vetted and if necessary equipped with a solidly-connected neutral throughout in the approved (and safe) up-to-date manner.

Yours faithfully,

Beckenham. J. G. EDENBOROUGH.

CLUB ANNOUNCEMENTS

Proposed Models Society for Peterborough

A meeting will be held at the Museum, Priestgate, on Friday, May 25th at 7.30 p.m. with a view to forming a new society. All model engineers in the district will be welcome.

Wellingborough and District Model Engineering Society

Our headquarters are now at "Springhill," Broad Green, and our future programme is to include visits to a newspaper office and works, an ironworks, and to the local locomotive shops. Our biggest job during the summer months will be the laying of a multi-gauge track around the beautiful gardens of "Springhill." We offer a hearty welcome to any one intereste din this or any other branch of model engineering.

Hon. Secretary: H. C. BAILEY, 27, Harrowden Road, Wellingborough.

Aylesbury and District Society of Model Engineers

The April meeting, held as usual at Hampden Buildings, Temple Square, was this time devoted to a talk by Mr. G. Dow, Public Relations Officer of the London Midland Region. His talk, "Modelling the Midland Railway," was very interesting, being fully illustrated with photographs. After a very comprehensive historical survey, he told us a little about his "O" gauge layout. A most enjoyable time, and many thanks to Mr. Dow!

Hon. Secretary: E. H. SMITH, Mulberry Tree Cottage, Devonshire Avenue, Amersham, Bucks.

The Tonbridge and District Model Railway Club

Our club has, so far, proved a great success, as is evident from the increased membership and the continued enthusiasm of all members.

Some outings to places of railway interest have been arranged for the summer season.

Work on the club layout has forged steadily ahead—the end section and centre section are now ready for track laying.

Ambitiously (we are not yet one year old), we have decided to hold a model railway exhibition in Tonbridge, from October 17th to 20th, 1951, inclusive, details of which have been circulated to all local clubs. Further particulars of same, and details of membership, may be obtained, by post, from the Hon. Secretary, A. C. GALE, 185, High Street, Tonbridge, Kent.

Harrow and Wembley Society of Model Engineers

FORTHCOMING EVENTS

The society's new track at L.M.R. Athletics Club Sports Ground, Headstone Lane, Wealdstone, is being officially opened at 3 p.m., on Saturday, May 26th, 1951, by R. A. Riddles, C.B.E., of the Railway Executive, and President of the Institution of Locomotive Engineers.

At the April meeting the society joined the K.S.E.E.C. to a sound film show arranged by the Shell Mex Company.

The first film, entitled "A New Hobby," dealt with model race cars; the second, entitled "Cornish Engine," gave excellent details of this well-known type of pumping engine; the third was entitled "Royal Silverstone Race" and, lastly, "Oil in Industry."

Mr. Brown, of the Shell Mex Company, very kindly introduced the show to a well-attended meeting and afterwards answered various questions asked by members relating to the last-named film.

Hon. Secretary: C. E. SALMON, 11, Brook Drive, Harrow.

P.A.D.S.M.E.E.

At the recent monthly meeting of the Plymouth and District Society of Model and Experimental Engineers, Mr. P. Williams gave a very interesting talk on "Ship Rigs," which he illustrated with many excellent drawings done by himself. Mr. Williams is a keen ship modeller himself, and at the conclusion of his talk, answered questions of marine interest.

The society is now fully occupied with the task of building the railway layout of the Plymouth area for the local Festival of Britain Exhibition to be called "Plymouth through the Ages." The original plans have had to be modified to suit the limited space available, which is approximately 50 ft. × 20 ft. and will be in 11 mm. gauge and fully automatic in operation.

Hon. Secretary: H. A. TUCKER, 42, Cobbett Road, Honicknowle, Plymouth.

Surrey Model Racing Car Club

The committee have pleasure in announcing the programme of race meetings to be held this season on our track at Chertsey Mead:—

June 2nd; June 17th, "Rogers Cup"; June 30th; July 15th, "Z.N. Cup"; July 28th; August 12th "Rickard Cup"; September 15th,; September 30th; October 14th; October 27th, "Haigh Cup".

On Sunday, August 26th, we are holding a really big competition, open to all clubs in the country.

The Edmonton Model Car Club have generously offered to let us use their new 70 ft. diameter track for this event. The track is situated at Picketts Lock Lane, Edmonton, N.18.

The following dates are important ones:—

Saturday, June 9th. B.O.A.C. exhibition and track meeting at Heston Aerodrome.

Sunday, June 24th. Derby Club, open meeting.

Sunday, July 8th. Edmonton Club, open meeting.

Sunday, July 29th. Cleethorpes Club, open meeting.

Sunday, August 19th. Speed championship heats at Edmonton Club track.

Sunday, August 26th. Surrey Club, open meeting.

Sunday, September 2nd. Speed championship finals at Cleethorpes track.

The events at our track will include inter-club team races, invitation meetings, novice events. The committee are hard at work doing their very best to cater for every type of model race car enthusiast.

Club track: Chertsey Mead, Weybridge, Surrey.

Hon. Secretary: C. M. CATCHPOLE, 26, Rutland Court, Queens Drive, W.3.

The Model Car Association

At the recent annual general meeting held at Derby, all the officers were re-elected with the exception of Mr. F. G. Buck, whose place as vice-chairman has been taken by Mr. F. C. Cook, of Sunderland.

All the officers were thanked for their services during the past year, and, on behalf of affiliated club members, a 1/100 second stop-watch was presented to the hon. secretary and treasurer, Mrs. I. W. Moore.

With only slight alterations, the sub-committees proposals for rules governing competitions were accepted.

At the Surrey opening meeting, Cyril Catchpole won the main competition, but his win was rather overshadowed by a run at 120 m.p.h. by a new member from the States. Among them, as usual, was Alec Snelling, who, with his Olwee-engined 2.5 special clocked 76 m.p.h. Seems a pity that electrical timing was not being used, so that records could have been claimed.

The S.W. Regional event will be held on August 19th, at Bath. An open event will be held on August Sunday by the Worcester club.

Hon. Secretary: G. E. JACKSON, Lime Grove, Chaddesden Derby.